DOCTOR OF ENGINEERING (ENGD)

The Companion Experience: A Thesis from the Study of the Evolving Home Television Experience

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Award date:
2018

Awarding institution:
University of Bath

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A thesis submitted for the degree of Doctor of Engineering
University of Bath
Departments of Computer Science and Psychology
September 2017

Abstract

The way we interact with media has changed. Devices such as laptops, phones and tablets now supplement television watching for many. This behaviour allows viewers to engage more deeply with, or engage with content unrelated to, the television content they are simultaneously watching. This leads to the possibility of leveraging devices in a living room to deliver a synchronous, holistic experience over two screensa companion screen experience. Although some examples of commercial companion screen experiences have been attempted, few have offered a genuinely enhanced experience to audiences. This thesis examines how it is possible to design experiences that truly add value to a television experience, asking the central research question, how should companion screen experiences be designed?

A number of companion screen experiences are developed and evaluated. A comparison chapter discerns how using the space around a TV to deliver a companion experience impacts a users experience when compared to a companion experience delivered more traditionallyon a tablet.

This leads to a more thorough investigation of the orchestration of companion experiences, addressed by using the novel approach of involving television professionals and audience members in the very initial stages of developing a companion screen experience, as a way of generating design guideline[s] for a companion experience. A potential guideline is uncovered for further investigation in the form of a hypothesis for testing. This hypothesis is then put under test in order to rigorously validate this design guideline for producers and designers of companion screen experiences. This rigorously-validated design guideline then leads to an important implication for broadcasters when it comes to providing and producing companion screen experiences.

A final contribution of this research is the many potential directions for future research that the thesis yields.

Contents

0.1 Publications

Sections of work reported in this thesis have previously appeared in peer-reviewed and open source publications.

The concept of 'smart wallpaper' detailed in chapter 3 was presented as a paper of the industry track at the 2014 ACM International Conference on Interactive Experiences for TV and Online Video:

> Campbell, R., Felton, R., & Hoare, C. (2014). Smart Wallpaper. In *Adjunct Proceedings of the 2014 ACM International Conference on Interactive Experiences for TV and Online Video*. figshare. doi: 10.6084/m9.figshare.1031620

A short paper detailing an evaluation, conducted in collaboration with colleagues at BBC R&D, of an interactive game for children using the 'smart wallpaper' system was presented at the 2015 Annual Symposium on Computer-Human Interaction in Play:

> Hoare, C., Campbell, R., Felton, R., & Betsworth, L. (2015). Hide and Seek: Exploring Interaction With Smart Wallpaper. In *Proceedings of the 2015 Annual Symposium on Computer-Human Interaction in Play*. New York, NY, USA: ACM. doi: 10.1145/2793107.2793143

The taxonomy presented in chapter 5 of the additional media activities that users engage in relative to a television programme was developed and published in an open venue in collaboration with a fellow PhD student at BBC R&D:

> Hoare, C., & Hinde, A. (2016, September). *Television and additional media activity: A taxonomy*. doi: 10.6084/m9.figshare.3856164.v1

0.2 Acknowledgements

Firstly, I would like to express my sincere gratitude to my lead supervisor Prof. Danaë Stanton Fraser for her continuous support of me, her patience, motivation, and immense knowledge. I could not have done this without your guidance, and cannot imagine having had a better supervisor and mentor for my doctoral study. Thank you.

I would also like to thank the rest of my supervisory team Dr. Phil Stenton, Dr. Stephen Jolly, and Prof. Eamonn O'Niell, for their insightful comments and encouragement over the years. Equally to all of my colleagues from my time within BBC R&D, and particularly to Dr. Alistair Hinde, Rosie Campbell, and Richard Felton, whom I was lucky enough to work closely with, thank you.

I would like to extend thanks to the EPSRC, the Centre for Digital Entertainment, the University of Bath, and BBC R&D for making this EngD a possibility.

To my family, Brendan, Kate, Stephen, Corin, Rafe, John, William, Lee, Andrea, and Daniel, thank you for all of your love and support over the past five years.

To my friends, thank you for understanding!

And finally, to Joe, my best friend, thank you for everything.

Chapter 1

Introduction

1.1 Thesis background: the changing face of television

In recent years, the way we interact with our televisions (TVs) has changed. Indeed, the way we interact with media in general has changed. The growth of digital methods of capture and distribution has allowed TV content to become detached from things like channels and scheduling, and even from TV sets themselves. Usage of digital video recorders (DVRs), like Sky+[1] and TiVo[2], and video on-demand (VOD) services, like BBC iPlayer[3] and Netflix[4], has soared. Whereas previously the TV was the dominant means of audio-visual media consumption in the home, the advent of digital media has brought about the means for media consumption and activity through separate devices, like laptops, phones and tablets. These devices have supplemented, and in some contexts replaced, the TV viewing experience for some. Supplementing TV watching by using another device simultaneously has been called second-screening, and it has enabled various new multi-tasking behaviours e.g. communicating about or engaging more deeply with TV content, or engaging with content unrelated to the TV content.

We can only anticipate that these changes will continue. TVs themselves are becoming more richly equipped, gaining Internet connectivity and more processing power than ever. Our homes in general are also becoming more richly equipped. As wearable technology, interactive surfaces and even virtual reality (VR) headsets become consumer products, there is an opportunity for media providers to deliver new and innovative living room experiences.

[1] Sky+ is Sky's flagship DVR service, see https://www.sky.com/.
[2] TiVo is a popular DVR service, see https://www.tivo.com/.
[3] BBC iPlayer is the BBC's flagship video-on-demand service, see http://www.bbc.co.uk/iplayer.
[4] Netflix is a popular video-on-demand service, see https://www.netflix.com.

This opportunity, however, represents a huge design challenge/space. There is relatively little active human-computer interaction (HCI) research into interaction within the living room being reported. One reason for this may be that HCI has traditionally been concerned with efficiency and task completion—seemingly at odds with the traditional aim of TV; entertainment. Accordingly, the methodological challenges for HCI research in this area are great; though timely and necessary.

1.2 Thesis scope: BBC R&D and companion experiences

The research presented in this thesis was funded by the Centre for Digital Entertainment (CDE), one of the UK Engineering and Physical Sciences Research Council (EPSRC) Doctoral Training Centres. The CDE partners every doctoral student with a company to conduct their research project within industry. This thesis represents a research project that was conducted in partnership with BBC Research & Development (BBC R&D) as part of their User Experience Research Partnership (UXRP).

1.2.1 Relationship with BBC R&D

The UXRP is a long-term collaboration project between BBC R&D and six universities, including the University of Bath. The general aim of the partnership is to explore the design space for new and innovative living room experiences: what they will be, how audiences will engage with them, and how they will be crafted and distributed.

The initial scope of this thesis was developed within these aims and in close collaboration with a team of researchers within BBC R&D—the User Experience Research section, recently renamed as the Future Experiences Technologies section. Specifically, a project R&D called 'smart wallpaper' was posited to the researcher as a starting point for this thesis. The smart wallpaper project imagined a future where it is possible to decorate the walls of your home with electronic wallpaper, turning every wall into a display and making it possible to change the look and feel of a room in an instant. This project formed a starting point for developing the research in this thesis. Of particular interest to the researcher was looking at smart wallpaper through the lens of designing holistic companion screen experiences.

1.2.2 Companion experiences

The companion screen experience is one example of a future living room experience that represents a unique HCI challenge.

As mentioned previously, the devices now available to us in our living rooms have led to new multi-tasking behaviours when it comes to TV watching, e.g. communicating about or engaging more deeply with TV content, or engaging with content unrelated to the TV content. But what if we could leverage the devices in a living room, to deliver synchronous, holistic experiences over two screens—a television and a second screen? This sort of experience is what is termed a companion screen experience throughout this thesis.

There have been some commercial attempts at companion screen experiences already, often taking the form of smartphone apps that allow users to 'play-along' with gameshows, or for advertisers to synchronise mobile advertising with television adverts. But there have been few commercial apps that offer a genuinely enhanced experience to audiences. How is it possible to design experiences that truly make something more than the original, that truly add value to a television experience? This is the primary challenge addressed in this thesis.

1.3 Research question and objectives

Given that the main aim of the thesis is to discover how it is possible to design companion screen experiences that are genuinely new, the main research question (**RQ**) is:

RQ How should companion screen experiences be designed?

This research question leads to the specification of four research objectives (**RO**s), which address the central research question within the scope of the thesis outlined in section 1.2. These are:

RO1 To explore the concept of smart wallpaper as a platform for innovative living room experiences (see chapters 3 & 4)

RO2 To specifically explore the concept of smart wallpaper as a platform for companion screen experiences, to begin the focus on companion screen experiences (see chapter 4)

RO3 To uncover a useful hypothesis for study around companion screen experiences, using the findings from **RO2**, interviews with television professionals and a study with audience members (see chapter 6)

RO4 To investigate the companion screen experience hypothesis formed in **RO3** (see chapter 7)

The accumulation of knowledge from addressing these research objectives can then be used to address the central research question.

1.4 Thesis outline

Chapter 2 provides the basis for the rest of the thesis. It gives an overview of the relevant work around the changing face of television and entertainment experiences in the home, to demonstrate the context for the thesis. It also provides an in-depth review and a critical discussion of a specific strand of this field: the companion screen experience.

Chapter 3 details the initial project the researcher worked on at BBC R&D, smart wallpaper (addressing **RO1**). It also reports on an initial exploratory study of a smart wallpaper experience—an interactive game for children. This work was undertaken in collaboration with colleagues at BBC R&D.

Chapter 4 reports on an empirical study undertaken by the researcher of a smart wallpaper experience—a companion experience. It compares the experience of companion content delivered via smart wallpaper to the experience of companion content delivered more traditionally, via a tablet. This addresses both **RO1** and **RO2**. The findings from this chapter influenced the direction of the rest of the thesis, focusing the remaining chapters (chapter 5, chapter 6, and chapter 7) solely on companion screen experiences.

Chapter 5 provides a taxonomy of additional media activities that users engage in to supplement television programmes, in order to define exactly what is meant as a companion screen experience for the remaining chapters of the thesis, and differentiate it from other additional media activities—as both chapter 6 and chapter 7 are heavily concerned with companion screen experiences. This work was undertaken in collaboration with a fellow PhD student at BBC R&D.

Chapter 6 reports on an exploratory study undertaken by the researcher aimed at uncovering a useful hypothesis around companion screen experiences, grounded in relevance, for the researcher to investigate. This was done via interviews with a television producer, and with television users. This addresses **RO3**.

Chapter 7 reports on an empirical study undertaken by the researcher of the hypothesis uncovered in chapter 6, addressing **RO4**.

Chapter 8 concludes, summarising the contributions and findings of the thesis.

1.5 Research contributions

The thesis makes two major contributions: a practical and a theoretical contribution.

A practical contribution is made through the development and evaluation of a number of companion screen experiences. In particular, the findings from these evaluations represent this contribution. For example, in chapter 4, a comparison of a novel type of companion screen to a traditional companion screen is presented, and evaluated. On top of this, the novel approach of involving producers and users in the very initial stages of developing a companion screen experience, as one possible way of generating design guideline[s] for a companion experience up front, is presented in chapter 6—and a potential guideline is uncovered for further investigation. Together with the subsequent rigorous validation of this design guideline in chapter 7, a real contribution is made to the field, addressing the central **RQ**.

A theoretical contribution is made through the definition of a companion screen experience within the context of all the additional media activities that television users engage in to supplement the programmes they watch. This contribution can be seen particularly in the taxonomy presented in chapter 5, but is also developed throughout the thesis. Equally, a theoretical contribution is made through the methods used by the researcher throughout this thesis to evaluate companion experiences and, specifically, the evolving rationale behind the methods employed. This contribution is developed throughout the thesis and reflected upon and refined in the concluding chapter, chapter 8.

A final contribution of this research is the many potential directions for future research that the thesis yields. Particularly in the insights of the television producer in chapter 6, not all of which were possible to address in this thesis, but also through the insights gathered throughout the thesis.

Chapter 2

Literature Review

2.1 Introduction

As described in chapter 1, the way that people interact with television is transforming. There has been a rapid increase in the number of screens per household, with the average British household owning 7.4 Internet-connected devices according to a 2015 YouGov survey [PressAssociation, 2015]. On top of this, the fact that many of these screens are often used as a means for entertainment, and even used simultaneously, means that those who produce television and video content face an interesting challenge in trying to both keep pace with and leverage these new living room screen ecologies and behaviours. This challenge is equally true of the field of HCI when it comes to investigating, informing and providing guidelines about this burgeoning area. The work presented in this thesis aims to make contributions to this new, nebulous and constantly evolving field, as described in chapter 1. This chapter provides the basis for the work and contributions presented in this thesis by providing a review of the most relevant literature. The review is structured as follows:

Firstly, it will give an overview of the relevant work around the changing face of television and entertainment experiences in the home, and the concepts for potential future home entertainment experiences this evolution has spawned, to demonstrate the wider context for the thesis.

Secondly, it will provide an in-depth review of a specific strand of the above field: the companion experience. Much of the work presented in this thesis is focused upon exploring and evaluating companion experiences to television. In general, a 'companion experience' refers to extra content and features a user may enjoy while watching a television programme. These extra content and features are often

provided via a dedicated web page or app, and displayed via an auxiliary screen. Such auxiliary screens are typically handheld devices (tablets and smartphones), or laptops; though the work presented in this thesis considers other novel secondary screens also. The use of an auxiliary screen whilst watching television, whether in companion with or distinct from the TV programme being watched, is referred to more generally as 'second-screening' in this chapter. This provides the basis for the work of chapter 4, chapter 6, and chapter 7 which deal directly with companion experiences, and chapter 5 which presents a taxonomy of companion experiences.

This structure allows for the work of the thesis to be placed in its wider context, whilst also providing the detailed analysis of literature needed to be built upon in the subsequent chapters of the thesis.

2.2 Evolving television experiences

In the context of the increasing proliferation of powerful digital technology in domestic situations, over the past few years there has been an increasing interest in how television and entertainment experiences can evolve. One of the things researchers have been interested in is whether television producers should do more than simply offer traditional linear programs.

There has, for example, been a lot of work around producing interactive narratives: from work on using narrative techniques as a technological abstraction to provide meaningful variation of story elements [J. H. Murray, 2011a,b; Szilas et al., 2012], to work on using gesture and/or haptic feedback as a way of naturally interacting with such interactive narratives [Chu et al., 2015; Clifton et al., 2013; Mateas & Stern, 2003], and even work on how these things improve feelings of dramatic agency and presence in these interactive narratives [Kelso et al., 1993; Dow et al., 2007]. One example of an interactive narrative is *Don't Open That Door*, a gesture-based drama based in the universe of a well-known TV show [Clifton et al., 2013]. It was designed to provide the possibility for dramatic presence, though researchers observed that many elements of the experience caused disruption to user feelings of presence. However, when evaluating the interactive narrative *Façade*, it was found that, overall, participants had a positive experience, and were motivated to repeat their experience [Knickmeyer & Mateas, 2005].

On top of this interest in interactive narratives, there has been an increasing interest in the ways in which TV can spill beyond its rectangular boundaries and onto the surrounding walls.

The Around-TV prototype, for example, utilises the space around the TV as a canvas to display additional content [Vatavu, 2013]. Customised controls, extra media

screens and widgets are projected onto the wall behind a TV, and can be interacted with using a Wii-mote[1]. Figure 2.1 shows the system concept. In building the Around-TV prototype, Vatavu wanted to explore what he termed 'augmented home entertainment', an emergent strand of research, where projected displays are teamed with existing physical displays to provide enhanced TV experiences. The Microsoft IllumiRoom is probably the most advanced demonstration of this [Jones et al., 2013]. The IllumiRoom is a prototype which also aims to extend the visual experience of television outside of its physical screen with projection. Unlike Around-TV, the IllumiRoom projections are intended to extend the content on screen in some way, as opposed to adding extra media screens and widgets. In particular, Jones et al. described the aim of their projections as 'negating, including or augmenting the physical environment' around the television screen. For example:

Negate This involves extending the field of view of the scene being shown on the TV screen, by projecting a 'surround' image onto the walls around the TV. This negates the physical environment by turning your whole room into the scene.

Include Jones et al. gave the following example to illustrate this idea, '[Imagine] the enemy throws a grenade towards you. The grenade rolls out of the television, bounces off your coffee table and explodes in your living room'.

Augment Jones et al. suggest several possible augmenting illusions. For example, using radiometric compensation to make the room look like a cartoon, or shading it black and white.

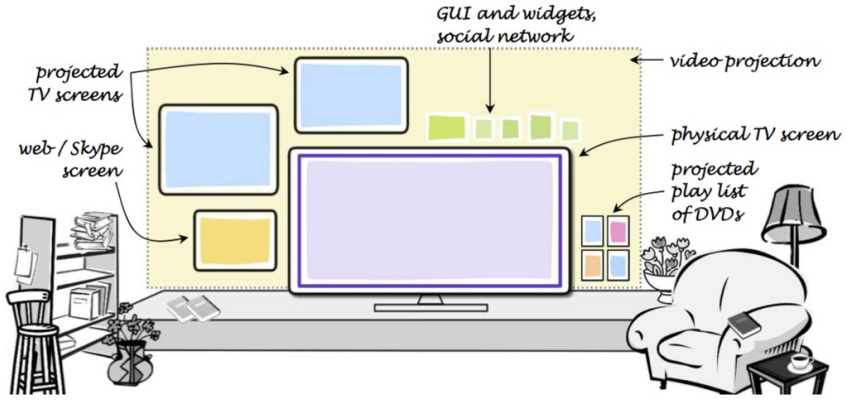


Figure 2.1: The Around-TV system concept [Vatavu, 2013]

[1] A Wii-mote is a unique controller for the Nintendo Wii console, http://www.nintendo.co.uk/Wii/Wii–94559.html.

The BBC's Surround Video prototype aims to provide a similar experience to the 'negate' projections Jones et al. describe, by extending the field of view of the scene being shown [Mills et al., 2011]. However, if using real footage, as opposed to the computer generated scenes used in the IllumiRoom, extending the field of view of the scene is not simple; specialist acquisition techniques are required. The MIT prototype Infinity-by-Nine addresses this problem; it is another augmented home entertainment system which can take any video content and produce illusions to be projected around the TV on the fly [Novy, 2013]. These illusions do not directly extend the scene being shown on the TV, but are coloured light fields, calculated based on the current frame of the video content being shown. Augmenting TV with complementary lighting has even been employed in a commercial product, the Philips Ambilight, a television which radiates appropriately coloured light from its sides and, thereby, 'fills your room with the perfect ambience' [Philips, n.d.].

Many of the prototypes and products described in this section all have the express aim of deepening the feeling of 'immersion' in users. Indeed, under testing, over 80% of participants indicated that Infinity-by-Nine increased their sense of immersion in the film content being shown [Novy, 2013]. Furthermore, the Philips Ambilight was shown to increase feelings of immersion, as evaluated using both self-report and physiological measures, when compared to a standard television [Weffers-Albu et al., 2011]. Immersion, though, is an oft-used yet ill-defined term. It is sometimes used, as is the case in some of the work described in this section, when physical immersion has been attempted. That is, when a viewer's full vision has been filled with a scene or similar, in order to simulate the viewer being 'in' the scene. However, it is also used to refer to immersion in content via information. This is explained well in the following quote from a 29 year old female, gathered by a market research firm [Gaskins, 2016],

> I wish there was an app that would give me information about the historical time period that the work took place during. What else was going on in the world when Elizabeth and Mr. Darcy were falling in love? Who was the king or queen of England? What would the characters typically eat for breakfast? What type of music did they listen to? Immerse me in their world.

This quote is reminiscent of the findings of Basapur et al. who studied a television companion experience which provided parallel 'feeds' of extra information on an auxiliary screen [Basapur et al., 2011]. They found that viewers felt a sense of immersion in the television programme content when provided with extra information on a second screen. In other words, there is more than one way to immerse a person, and television companion experiences that provide extra information may do this too—the next section covers companion experiences in more depth.

2.3 Companion screen experiences

Using a secondary device while watching TV, or second screening, is now a standard behaviour. It can be seen in many technical reports, with Nielsen reporting in 2012 that 85% of mobile device owners used their device while watching TV at least once a month, with 40% of them doing it daily [Nielsen, 2012], and Accenture reporting in 2015 that 87% of TV viewers are also using their personal devices (smartphone/ tablet/laptop) whilst watching TV [Mann et al., 2015]. Indeed, it has even been noted in various published studies, with Courtois et al. reporting that personal device usage in the living room was rising, with personal screens being incorporated into the experience of watching television [Courtois & D'heer, 2012], and Rooksby et al. suggesting that second screening was a prevalent behaviour in their field study [Rooksby et al., 2014].

As a result of this widespread second screening behaviour, there has been increasing interest in how television and personal devices can be deliberately combined to create novel experiences for users—known as companion experiences. Possible such companion experiences that have been posed include those that provide extra information on the second screen that is related to the television programme (see [J. H. Murray et al., 2012; Basapur et al., 2011; Dowell et al., 2015] amongst others), and those that provide play-along games (see [Williams, 2013; Channel4, 2012]). This section surveys this work in detail.

2.3.1 Early companion work

One of the earliest explorations into the combination of a handheld device and a TV was by Robertson et al. in 1996 [Robertson et al., 1996]. The combination of a personal digital assistant (PDA) and a TV was used in a property application for house-hunters. The PDA allowed the user to browse and select information and schematics about property for sale, while images, video and detailed maps were displayed on the TV. The study resulted in several design guidelines (outlined below), which are a good benchmark to reason about companion screen experiences in the living room, and multi-screen experiences in general:

Use each device appropriately Devices differ in their strengths. For example, the researchers found that TVs are appropriate for high quality video and audio output, but not for text or schematics, which are more appropriate on a handheld device. Devices do not only differ in display strengths, however, but also in interaction strengths. User tasks also influence which device is more appropriate for parts of a multi-screen experience.

Combine the devices appropriately Device coordination and/or synchronisa-

tion is critical. For example, in the property application a user may view a house on the TV screen but then begin to read the description for a new house on the PDA. If a picture of the old house remains on the TV there is potential for confusion.

These guidelines were then used in early companion screen work to reason about multi-screen experiences. For example, Fallahkhair et al. in 2005 used a companion screen approach to design and implement a system that facilitates language learning [Fallahkhair et al., 2005]. The researchers used a second screen to, amongst other things, provide help for difficult cultural or language items on the TV. Additionally, some studies suggested users wanted remote controls with screens [Bernhaupt et al., 2008] and to 'access different services on different display panels rather than overloading one shared display panel' [Seager et al., 2007]. This kind of suggestion underpinned investigations into placing electronic programme guides (EPGs) on second screens [Park et al., 2006; Cruickshank et al., 2007]. Cruickshank et al. identified that for many users, whilst they greatly valued the services offered by their TVs, such as the EPG, the need for these to occupy the same display space as the main image was a cause for conflict. Hence, the researchers took a companion screen approach to TV interaction, offering both the EPG and other remote control options on a PDA. They reported that the majority of their participants found employing a handheld device as an EPG, leaving the main TV picture free of obstruction, very useful.

Other early work explored how second screens in the future could move TV towards a two-way dialogue as opposed to the one-way 'push' media model it has traditionally followed [Miller, 2005; Davis & Yung, 2005]. Indeed, Miller even discussed how the TV consumer could become a participant in a TV show [Miller, 2005]. This idea, of giving a user more control over a TV show, was explored in more detail by Cesar et al. [Cesar et al., 2008, 2009]. These papers put forward an architecture where users could control the television from a handheld device using an EPG-like functionality, transfer the TV content onto their handheld for mobile viewing, fragment content in order to enrich it in some way, and share the TV content with their friends.

The early themes that emerge from this work are:

There is value in providing richer services to experience and interact with TV
Cruickshank et al. concluded that 'a more sophisticated form of input and control needs to be introduced for iTV to reach its full potential' [Cruickshank et al., 2007], while Seager et al. report that users 'frequently use their laptop to surf the web, use email, or shop online whilst watching television', suggesting these systems should be capable of providing multiple, synchronised services at the same time [Seager et al., 2007].

Overloading the television display is a bad idea Seager et al. found that 'there was a preference for accessing different services on different display panels rather than overloading one shared display channel' [Seager et al., 2007], and this was echoed in almost every paper reviewed in this section [Fallahkhair et al., 2005; Cruickshank et al., 2007; Robertson et al., 1996; Cesar et al., 2008, 2009].

These early themes provided a good baseline for subsequent work to explore second screening and companion screen experiences, the state-of-the-art in this area is outlined in the next section.

2.3.2 Current companion work

The research in the field of companion experiences and second screening accelerated dramatically with the huge proliferation of touch screen devices through domestic spaces. There have been several commercial deployments of companion experiences, along with field and empirical studies, as well as technical work around device synchronisation and technical architecture in order to deliver the possibility of companion screen experiences. The research in this area can be roughly grouped into four themes, all of which represent a 'lens' through which companion experiences and second screening have been studied: *architectures and synchronisation*, *augmenting television*, *socialising*, and *attention over two screens*—each of these is detailed in the following sections.

2.3.2.1 Architectures and synchronisation

As highlighted in section 2.2, it has been clear from the very early days of second screen research that device synchronisation between TV and second screen is crucial for companion screen experiences to work. As such, a particular technical area of work has been focused on how to achieve synchronisation between the two display devices. Several areas have been investigated, including audio watermarking [Kim et al., 2004], and timeline insertion [Howson et al., 2011]. These approaches require the insertion of an additional signature into the media content itself. A couple of approaches have sought to achieve synchronisation without impacting the original content, using audio fingerprinting and cross correlation [Duong et al., 2012]. However, scalable solutions are undoubtedly the most powerful, which is why the HbbTV EU project is ensuring these solutions become a standard part of TVs [van Deventer et al., 2013]. Therefore, accurate device synchronisation between television and second screen over a home network is something that will soon be a reality.

2.3.2.2 Augmenting television

As a result of both the advances in synchronisation, and the increasing ubiquity of handheld devices, there has been much work prototyping potential companion screen experiences. In this way, researchers can learn more about them, and more rigorously conceptualise the field. For example, second screen companion experiences have been developed to add auxiliary streams of information and media [Basapur et al., 2011, 2012], augment sports programming with games and statistics [Anstead et al., 2014; Centieiro et al., 2013], or to help users become embedded in complex story worlds [J. H. Murray et al., 2012; Nandakumar & Murray, 2014]. Equally, content providers have released companion apps to the public, often taking the form of games [Williams, 2013; Channel4, 2012]. Indeed, the companion app to Channel 4's Million Pound Drop has been commercially very successful, with over a million downloads in the first three months after its release [Channel4, 2012].

Over the course of several studies [Basapur et al., 2011, 2012], Basapur et al. investigated augmenting TV content with a parallel 'feed' of additional media on a secondary screen (a laptop PC). In one study, a feed consists of related information (e.g. IMDB trivia[2], news stories, Wikipedia information[3]), comments from social networking sites, and related multimedia (e.g. photos, music, videos) [Basapur et al., 2011]. Participants reported that the parallel feeds enabled their usual habit of searching for extra information on the Internet. One participant noted that they had gotten into the habit of having their laptop out when watching TV prior to the study, because of the urge to look up information. However, they found that this meant they often did other things and became distracted. They found the parallel feeds took care of this, by taking over the laptop and providing plenty of extra information, therefore allowing them to pay greater attention to the TV programme. Other participants observed that the feed seemed to cover everything they were thinking about searching for, meaning they didn't have to. A follow-up study yielded an interesting observation about the 'lean-back' nature of the feeds. In the study, the second screen experience was similar in feel to that of the previous study, but in this case users themselves created the feeds as part of the experience [Basapur et al., 2012]. A feed was created as the show was being watched, participants were encouraged to post the trivia, news headlines and multimedia themselves, thus generating the feed for their network of friends. However, this change was revealed to be a large barrier to adoption. Creating posts for a feed was considered to be very distracting by participants and therefore detrimental to their experience. This suggested aggregated feeds of extra information synchronised to a TV programme should be provided as a passive, 'opt-in' experience.

[2]The Internet Movie Database (IMDB) is an online database of information related to films, television programs and video games, see http://www.imdb.com/.

[3]Wikipedia is free online encyclopedia, see https://en.wikipedia.org/.

Murray et al. saw a possibility for using second screens to aid viewers of complex dramas [J. H. Murray et al., 2012; Nandakumar & Murray, 2014]. Dramas have become increasingly complex with the growth of digital formats. Keeping events from past seasons current in viewer's minds, through DVDs and web-based fan activities, has provided incentives for writers to create complex plots that arc across multiple episodes and even multiple seasons. But more complex plots and larger casts of recurring characters can leave viewers confused. Indeed, the HBO Go app [HBO, n.d.], available on desktops and mobile devices for showing television content to subscribers, offers a sidebar of extra annotations synchronised with the streamed content to help viewers of these complex dramas. Murray et al. built a companion app to perform a similar task on a tablet second screen [J. H. Murray et al., 2012]. The app shows synchronised information in the form of character maps, relationship recaps and thematic recaps. Under testing, participants described the app as 'very helpful' and 'extremely useful' [Nandakumar & Murray, 2014].

Augmenting a television programme with extra information has many positives. It can help viewers to understand long-form narratives, enable them to feel more immersed in the narrative world, and, overall it can enable them to focus more on the show itself without the distraction of searching for extra information themselves. In a world where niggling questions can be settled almost immediately with an Internet search, viewers have a larger appetite for story information. Users valued most that parallel feeds of extra information anticipated, and negated the need for, Internet searches they might wish to carry out. On the other hand, creating the feeds themselves was considered particularly distracting. This again suggests that providing synchronised extra information as a passive, lean-back experience should be further explored.

2.3.2.3 Socialising

Some early second screen research focused on the design, implementation and study of companion systems meant to enhance user's social connections with friends and family during TV viewing. In their original paper, Cesar et al. described sharing as one of the core grounding features of second screen experiences [Cesar et al., 2008]. FanFeeds, described in the previous section, was a companion screen experience that encouraged and relied upon the sharing of related content about a show amongst an already-existing small group of friends [Basapur et al., 2012]. Recently though, with the increasing popularity of microblogging services such as Twitter[4], discussions about social TV have shifted focus towards studying viewers' synchronous use of these social services via second screen. As an example, Lochrie

[4]Twitter is a micro-blogging social media website, https://twitter.com/.

and Coulton conducted a study around the reality TV show *The X Factor*[5] [Lochrie & Coulton, 2012], finding that live-tweets about the show significantly correlated with the show's content. Lochrie and Coulton speculated that mobile phones were becoming a second screen for TV not through broadcaster provision of services, but through viewers themselves creating their own forums for discussion. For more see [McPherson et al., 2012; Doughty et al., 2012; Schirra et al., 2014].

2.3.2.4 Attention over two screens

Second screen experiences have also been studied through the lens of attention. Second screen apps on handheld devices are intended to enhance the viewing experience of users, but multiple screens must compete for attention. That is, users cannot pay attention to two screens at the same time. So, if attention is not appropriately directed between screens, usage of a second screen app on a handheld device could actually diminish rather than enhance user engagement with an experience. This has been found in several studies [Vinayagamoorthy et al., 2012; Basapur et al., 2012; Geerts et al., 2014]. Basapur et al., for example, reported that participants in their study of a second screen experience felt that the mental and physical effort needed to engage properly with the companion app while watching TV was a significant barrier to adoption [Basapur et al., 2012]. In addition to this, Vinayagamoorthy et al. found there was a complex relationship between participants, TV content and synchronised content on companion screen in their study [Vinayagamoorthy et al., 2012]. Participants felt there were times at which they were being pulled between each stream of content—there was a cognitive strain provided by the simultaneous content which demanded too high a level of focus.

As a result of these issues and observations, several researchers have attempted to rigorously examine attention to second screen experiences using eye-tracking [Holmes et al., 2012; Brown et al., 2014]. Holmes et al. studied visual attention via eye-tracking to two television shows with complementary second screen applications - one a drama, the other a documentary. The second screen apps were perused by the participants over a tablet computer and provided interactive experiences synchronised to programme content (such as polls or quizzes) [Holmes et al., 2012]. They found that the TV got the largest percentage of visual attention; participants gazed at the television 63% of the time. The tablet earned 30%, with 7% going off screen. Periods of greater visual attention on the tablet aligned with pushes of interactive content, and ad breaks. Interestingly, they found there were few seconds without some attention on the tablet. Monitoring of the tablet occurred during periods without interactive pushes or ad breaks - and accounted for 24% of gaze time in these periods.

[5] *The X Factor* is a British reality television music competition to find new singing talent, see http://www.itv.com/xfactor.

Brown et al. also studied visual attention via eye-tracking to a companion screen experience, and their results highlight a number of factors that appear to affect the distribution of attention [Brown et al., 2014]. They found the overall split of attention to be roughly 5:1 in favour of the TV. As in [Brown et al., 2014], participants would shift attention to the tablet when it updated with new content. There was also some evidence to hypothesise that shifts from the TV to the tablet were primarily visually driven, while those back to the TV were as a result of audio cues from the TV itself.

Both of these studies have certain limitations, expressed by Brown et al. in their discussion. Firstly, it is difficult to know how the results of either study generalise. Does the genre of television show or the nature of the synchronised companion content on second screen influence visual attention? Does this account for how different the split of visual attention is in both studies? On top of this, there are certain methodological challenges in terms of ecological validity that these studies have to grapple with. Holmes et al. commented on how the setting of their experiment had a 'demand' component [Holmes et al., 2012] and Brown et al. noted that their experimental set up called for the second screen (a tablet) to be mounted in front of the participants; detracting from the intrinsic handheld nature of a tablet [Brown et al., 2014]. For example, Brown et al. note that mounting the device meant that the tablet updates would have been visible in the peripheral vision of the participants, which might not have been the case if it were placed flat on a table or chair. Despite these challenges, these studies have some takeaway headlines worth bearing in mind:

1. Shifts in visual attention from TV to handheld appear to be primarily visually driven, while those back to the TV appear to be as a result of audio cues coming from the TV itself [Brown et al., 2014]. Peripheral vision may have something to do with this.

2. Viewers frequently monitor the second screen for interactive content, interrupting the viewing of the TV programming [Holmes et al., 2012]. This may be caused by not properly directing attention between screens.

It is important to consider attention in multi-screen environments. It is not possible to pay attention to two screens at the same time, and as such, user attention needs to be properly directed. Furthermore, working memories have a limited capacity and can only process so much information at a time, so adding two sources of information undoubtedly adds to the demand on our cognitive resources. This demand is then increased when attention is not orchestrated properly, creating a sense of confusion and time pressure. It's possible that investigating this demand on cognitive resources, known as mental workload, during multi-screen experiences will be able to give a good indication of how well designed an experience has been, while visual attention information can help to more fully interpret mental workload.

2.4 Conclusion

Research into companion screen experiences, while relatively young, has formed around a number of strong themes. The early work is summed up by saying that whilst users see much value in having richer television experiences, they dislike the television display itself to be overloaded—laying the groundwork for investigations into providing these richer services on secondary screens. As a result, there has been much work done to enable communication and synchronisation between TV and secondary screens, to make synchronised companion screen experiences possible. Possible such experiences have been prototyped, often focusing around either augmenting a TV show with extra information, or increasing the social engagement users can have when watching a TV show. Although when studied, users raised concerns about the delivery of extra information services, suggesting they did not accommodate 'winding down' in front of the TV, indicating an investigation of more lean-back delivery would be valuable. Equally, users of another such experience reported feeling pulled between different streams of content. This is then echoed in other studies that looked at attention in these experiences. These studies attempt to understand how attention might be orchestrated over 2 screens, considering that, intuitively, bad orchestration could lead to bad experience. One such study reported that users ended up monitoring both screens in a companion screen experience for updates, arguably detracting from the user experience. Another such study highlighted the potential importance of having both devices within field of view, so that updates could be seen by the user. Relatedly, there has also been work on augmenting TV experiences by spilling beyond its rectangular bounds; increasing the information in the field of view of the user.

A possible gap emerges around the provision of providing richer TV services, like extra contextual information, around the TV in the field of view of the user. That is, would providing services around a TV mitigate some of the identified attention orchestration and overload issues, by placing updates in the field of view of the user? Would the nature of not handling the secondary screen make it a more lean back experience? And how is it possible to address, assess and measure these questions? Chapter 3 andchapter 4 explore these questions, with chapter 3 investigating spilling beyond the bounds of TV and chapter 4 exploring using this space to deliver companion experiences.

A further possible gap emerges around the language around companion experiences. It may have been become clear in this review that the language around companion experiences is not particularly clear. The terms used have included 'second screen' [Schirra et al., 2014; Neate et al., 2015; Geerts et al., 2014], 'second screening' [Doughty et al., 2012; Courtois & D'heer, 2012], 'second screen experience' [Basapur et al., 2012; Torpey & Bloomberg, 2014], 'media multitasking' [Brasel & Gips, 2011; Brumby et al., 2014], 'companion content' [Schirra et al., 2014; Brown et

al., 2014] and 'companion experience' [Basapur et al., 2012; Nandakumar & Murray, 2014], amongst others. A structured taxonomy could be useful for the field—chapter 5 explores this more.

Chapter 3

Smart Wallpaper: Concept, Prototype and Initial Case Study

3.1 Introduction

> *It's Sunday night, and Alice is settling down with the Glastonbury coverage for the evening. She heads into her living room with a glass of wine, navigates through the programme of events on her tablet, and decides to head to the Pyramid Stage and watch the Rolling Stone set. Immediately, the television shows her the live set, her wallpaper transforms into a psychedelic pattern, the photos in her usual photo frames transform into photos from festival-goers, and posters from the festival appear on her walls...*

Display technologies are evolving. The bulky cathode ray tube (CRT) televisions that used to be at the centre of most living rooms are a thing of the past, replaced by flat panel TVs that are lighter, more energy efficient and allow for larger screen sizes [Derbyshire, 2005]. Indeed, with new flat panel innovations like ultra-high-definition (UHD), screen sizes are continuing to increase year on year [IHSMediaRelations, 2015]. Furthermore, the development of organic light-emitting diode (OLED) displays has allowed companies such as LG and Samsung to debut thin, highly flexible screens [Vincent, 2015]. Should these display trends continue, it is very likely that wall-sized displays will become common in homes. Which poses the question: if it were possible to decorate the walls of the home with displays, and therefore control and change them at will, what experience possibilities would that

create?

BBC R&D have termed the possibility of wall-sized displays in the home 'smart wallpaper', in order to investigate and determine some of the implications that wall-sized displays in the home would have for media organisations. In general, anticipating future technologies and determining their implications for media organisations is an important part of BBC R&D's purpose. They are committed to investigating the media possibilities that emerging and future technologies will allow, both for audiences and media professionals [Conroy, 2016]. More specifically, investigating the implications of smart wallpaper interested BBC R&D because of its potential to transform the experience of living room entertainment, and was equally of relevance to this thesis as a potential platform for multi-screen experiences.

In order to progress the investigation of smart wallpaper as a platform for media experiences, a practical approach was decided upon in collaboration with BBC R&D. There was a need to build a system that could simulate smart wallpaper, so that smart wallpaper experiences could be easily prototyped and evaluated. This chapter describes the system that was designed and built for this purpose. It also describes the first smart wallpaper experience that was prototyped and evaluated on top of that system—a game for young children based on hide and seek. It was decided to prototype particular smart wallpaper experiences to study in more detail as case studies. This chapter and the next detail two of these case studies.

3.2 Smart wallpaper

3.2.1 Design

3.2.1.1 Context

The design of the simulated smart wallpaper system was informed by the following approach, often employed at BBC R&D. Firstly, a review of literature was performed to gather design principles from relevant work already done in the area of large displays. Then, these design principles were used as a basis for brainstorming about smart wallpaper and what principles it should adhere to, and what constraints it might have (this was conducted in collaboration with colleagues at BBC R&D). These new principles and constraints were then used to brief a graphic designer who mocked-up some visuals of smart wallpaper in use (also conducted in collaboration with colleagues at BBC R&D). This was with the express aim of assimilating all the findings into the design and implementation of a system that could be used as a platform on top of which multiple smart wallpaper experiences could be prototyped. The output of some of this design process was published with colleagues from BBC

R&D [Campbell et al., 2014].

3.2.1.2 Related work

Large displays (whether screen-based or projector-based) have long been investigated within the field of HCI. Often studied in the context of the office meeting, electronic whiteboards represent the starting point for much of the work on large displays. Prototype electronic whiteboard systems such as Tivoli [Pedersen et al., 1993] and Flatland [Mynatt et al., 1999] provided interactive screens that supported freehand pen input, enabling a single user to draw on a screen, and save and share their notes and drawings with others in a meeting. Such large interactive screens that are built into an environment to support groups of users were subsequently termed 'situated displays', and continued to be studied in the context of the office meeting. iRoom [Johanson et al., 2002] and iLand [Streitz et al., 1999] were two of the first environments that had suites of large screens installed, and many prototype environments with situated displays have been presented since, and their effects on office meetings scrutinised [Inkpen et al., 2005; Rogers & Lindley, 2004]. Beyond this, large displays have widely been studied in the context of education as a tool for learning [Kennewell, 2006; Marcano, 2009; Stanton et al., 2001], though they have very rarely been studied in the context of the home.

Although large displays have not been widely studied in the context of the home, a few examples of prototype home environments containing large displays have been presented. The Around-TV prototype, for example, utilises the space around a TV as a canvas to display additional content [Vatavu, 2013]. Customised controls, extra media screens and widgets are projected onto the wall behind a TV, and can be interacted with using a Wii Remote. Cisco's Fresco prototype utilises tiled liquid-crystal display (LCD) screens to create a large display, which is then used to deliver television programmes, advertisements, user emails, personal reminders, and so on. This content can then be controlled via personal devices, using a dedicated app on a tablet, for example. It should be noted that neither of these systems has been subject to a rigorous user study—they are solely prototype systems that have been presented to interested parties. As such, while the interaction design and implementation of these prototypes should inspire the design of smart wallpaper, there are some reported user studies of large displays that are more insightful. Specifically, those that have been studied in more informal or personal contexts.

Brignull et al. in 2004 studied the use of a large display in an informal setting: a school common room [Brignull et al., 2004]. The display (named Dynamo) was designed to enable the sharing and exchange of a wide variety of digital media. The researchers noted that there was 'a high uptake of the various functions' of the large display in the common room. They suggested some design principles they adhered

to as potential reasons for this. These included:

- *Integrate the interactive display with the other artefacts used in the space*: informal, communal spaces are configurable and contain different artefacts that can be moved around and rearranged to suit the community of people. The researchers suggest that when developing interactive display systems it is important to consider these variable properties of the physical space in order to fully integrate the technology into an environment.
- *Provide flexibility in terms of interaction with the interactive display*: for example, Dynamo was flexible in terms of the personal devices it supported, allowing users to choose their mode of interaction to a point.
- *Design display applications (apps) so that users can adapt them to their existing activities*: the researchers suggested that when designing for social spaces it is important not to overly structure interactive apps for particular activities or use. The use of the large display should be able to flex and change with the rhythms and routines of the informal space that it is situated in, and available apps should allow that.

These principles are highly insightful when thinking about the design of a smart wallpaper system.

The study of mobile phone projectors is another area of interest when thinking about the design of a smart wallpaper system. As a personal large display, any design principles uncovered by work in this area are highly relevant to the design of smart wallpaper. In particular the work by Wilson et al. [Wilson et al., 2011] and Cowan et al. [Cowan et al., 2011] provides insight into the kind of content that might be (in)appropriate for personal large displays. Both of these pieces of work report on field studies of projector phone use—with experience-sampling [Wilson et al., 2011], diary studies [Wilson et al., 2011], and 'in-the-wild' methodologies [Cowan et al., 2011] used. Both sets of researchers suggest that users had some privacy concerns—that while many users were happy to display some personal content (such as photos) openly, they were less comfortable doing the same with text-based personal content (such as emails or text messages). Users implied that the difference between the personal content they were happy to share and the personal content they were not was to do with the fact that incoming emails and messages had not been pre-screened by them, and therefore could contain confidential information. This led to Wilson et al. suggesting that designers of personal large displays may wish to avoid the automatic display of incoming emails and text message. In general, users wanted to see content in the projection that they could access elsewhere—but they preferred it in the projection because they didn't want to work too hard find it, or didn't have the relevant devices to hand—users enjoyed the physical ease-of-access to informa-

tion that the projector provided. That is particularly interesting when collecting principles for the design of smart wallpaper.

While these particular studies are useful from the perspective of the 'everyday' use of an informal large display, there is some other work which provides insight into some of the potential 'entertainment' uses of a smart wallpaper system. Increasingly, researchers are exploring how television experiences can literally spill beyond the rectangular bounds of television - and onto surrounding walls. MIT's Infinity-by–9 [Novy, 2013], Microsoft's IllumiRoom [Jones et al., 2013], and BBC R&D's Surround Video [Mills et al., 2011] are examples of this. All aim to extend the visual experience of television outside of its physical screen with projection, filling a user's peripheral vision in the hope of achieving a more immersive experience. This kind of enhanced, immersive home entertainment experience is something else that smart wallpaper would be able to provide, and as such should be considered in the design of smart wallpaper—in terms of both the provision of the experiences themselves, and also the ability to switch between 'everyday' and 'entertainment' uses.

This focused literature review highlighted several insightful principles deemed important when thinking about the design of smart wallpaper. The next section will set out these design principles in detail.

3.2.1.3 Principles

The following takes the relevant design implications and recommendations from the related work, and forms a clear set of design principles that a smart wallpaper system should adhere to. These are:

1. Smart wallpaper should be able to easily integrate into homes and therefore with other artefacts in those homes. That is, it should be configurable to furniture, house plants, and so on.

2. Smart wallpaper should provide applications (apps) for users. Equally, it should allow for the development of further apps such that smart wallpaper may be easily extended. It is recommended that the apps provided are flexible and open in nature so that they can be adapted by users to suit their purposes.

3. Smart wallpaper should be able to transfer between everyday use and entertainment use as quickly and as easily as possible.

4. Smart wallpaper should make it easy for a variety of devices to connect to it and to control it. This is to facilitate a wide range of options for user interaction.

5. Smart wallpaper should be able to dynamically change its apps and their content and apps so that it can reflect the rhythms of user routines.

6. Smart wallpaper should allow for ease-of-access to information of interest to users. This is an application/content recommendation.

7. However, smart wallpaper should not necessarily show incoming, personal communications due to user privacy concerns. This again is an application/content recommendation, and is a caveat to principle 6 above.

3.2.1.4 Visuals

The following images are visual mock-ups of the potential smart wallpaper system. They were generated by briefing a graphic designer on the principles laid out in the previous section.

Figure 3.1: A normal living room, before applying smart wallpaper

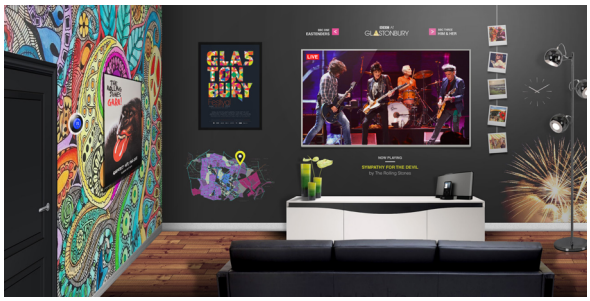


Figure 3.2: A smart wallpaper system accompanying the Glastonbury coverage

Figure 3.3: A normal living room, before applying smart wallpaper

Figure 3.4: A smart wallpaper system accompanying the One Show

Figure 3.5: A smart wallpaper system accompanying Doctor Who

Figure 3.6: A normal teenager's bedroom, before applying smart wallpaper

Figure 3.7: A smart wallpaper system accompanying a Radio 1 broadcast

3.2.1.5 Summary

As stated previously, this section has documented the many-step approach that was taken to inform the design of a smart wallpaper system. It encompassed a review of the relevant work already done in the area of large displays, the forming of a set of design principles that smart wallpaper should adhere to, and the briefing of a graphic designer who mocked-up some visuals of smart wallpaper in use. The following section documents the system that was designed and implemented in collaboration with colleagues at BBC R&D as a result of the approach reported here.

3.2.2 Implementation

3.2.2.1 Data model

The environment in which the prototype smart wallpaper system works is modelled in terms of *rooms* that contain *walls*, which can display content. This model describes the state of a home with smart wallpaper and forms the basis for the program interfaces that the system exposes.

- *Rooms*: A room is a three-dimensional space that has a name to identify it.

Any number of rooms may exist, though each room is intended to map to the physical existence of a room. It can contain any number of walls.

- *Walls*: A wall is a rectangular plane within a room on which we can display content. Each wall is intended to map to the physical existence of a wall inside a room, and it is therefore a child of this room: each wall can only belong to one room. It can have any number of layers associated with it.

- *Layers*: A layer can be associated with any number of different walls, and is a mechanism by which content is rendered on walls. One layer can contain any number of associated 'gizmos'. Layers are intended to give flexibility to the content that is shown on walls. For example, one layer might contain a wallpaper pattern gizmo, and be associated with all the walls in a given room. In this way, an update to this one layer (e.g. changing the wallpaper pattern) is then reflected on all the room's walls.

- *Gizmos*: A gizmo can be associated with any number of different layers, and is a way of encapsulating an item of content that is to be rendered on the walls. Gizmos might identify themselves as, for example, clocks, photo albums or wallpaper patterns.

3.2.2.2 Architecture

The prototype system is built from standard web components. This is so that any web browser can render a wall, and therefore any device with a web browser can effectively 'be' a wall. This allows for rooms with smart wallpaper to be simulated with relative ease, through the display of full-screen browser windows on wall-sized displays. See section 'Setup' below for more detail on the setup used at BBC R&D.

The system architecture includes a server, which stores the state of all the rooms, walls, layers and gizmos that the system is aware of, using the data model defined in 'Data Model' above. The server exposes a RESTful API, allowing the stored state to be read and manipulated using GET, PUT and POST requests.

The server also serves the HTML5/JavaScript pages that presentation clients must load to render that state. Once a browser has registered as a presentation client, it retrieves the relevant state from the server for rendering and establishes a connection to the server using Socket.IO to listen for updates to its state.

An HTML5 administration interface that exercises the RESTful API is also served, allowing direct manipulation of the state. The state can also be manipulated via the API by any device capable of making simple HTTP requests, making it easy.

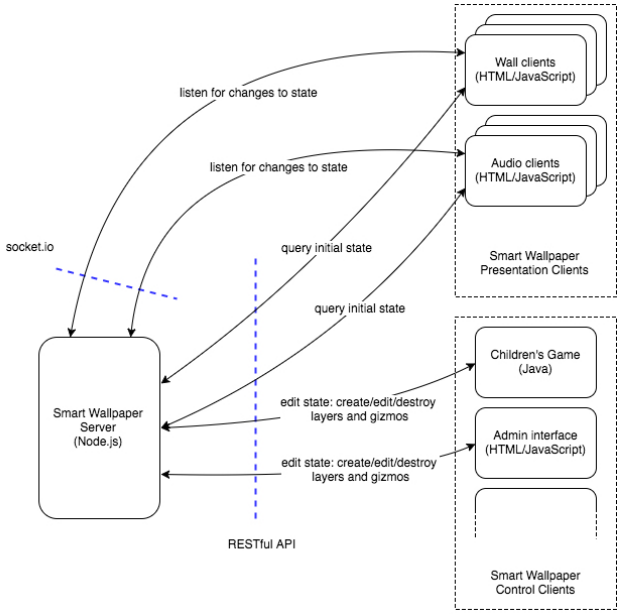


Figure 3.8: A high-level diagram of the smart wallpaper system

3.2.2.3 Clients

There is a base level of functionality common to all clients: the ability to connect to the smart wallpaper server and respond to relevant changes in the state. The most important presentation client within the system is obviously the 'wall' client, responsible for rendering wall content within a browser window. The other presentation client developed within the system was an audio client, created to support a use case with simple spatial audio.

The wall client uses a single browser window to render all the content associated with a given wall. Each layer on the wall is rendered in a separate HTML5 canvas element. As described in the data model, each wall can have multiple layers, so each wall client could be displaying multiple canvas elements at any one time. Each layer has properties associated with it that are used to determine how it should be rendered. For example, the z-index property of a layer is used to set the z-index of the layer's associated HTML5 canvas element. This defines the order of visibility of the layers: which should be rendered on top and which should be rendered underneath. Figure 3.9 shows an example of this. On the left, there are two layers: a layer with a full-wall wallpaper pattern and a layer with everyday gizmos (a clock and photos). On the right, there is an extra layer: a layer with a full-wall image of an African sunset. This illustrates what could happen if a user entered a smart wallpaper content experience: a layer could simply be added on top of the existing ambient layers for the purposes of the experience and then removed when the experience is

over. Because z-index is a property of the data model, an HTTP request can be sent to change the z-index of a layer, which will cause it to move up or down the visibility stack.

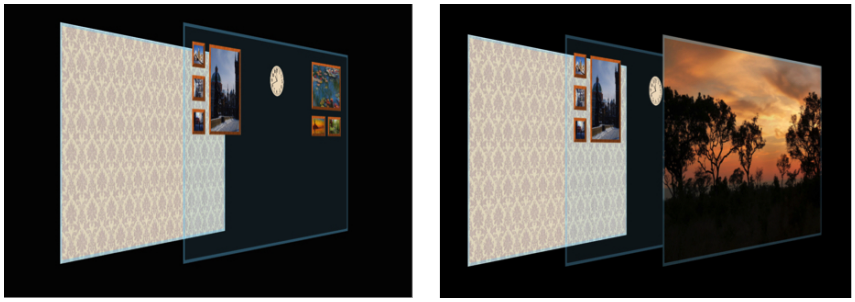


Figure 3.9: The order of visibility of the layers

Each gizmo has access to the canvas context of the layer to which it is assigned, and each gizmo contains a 'draw' function that draws directly to this context. A gizmo must implement a draw function that will be called whenever the gizmo needs to rendered.

Each layer has a render function, which simply loops through each of its gizmos calling their draw functions.

The audio client was a bespoke client developed due to the need for a very simple spatial audio solution for an interactive smart wallpaper game (discussed in the section 'Initial case study' below). Positioning speakers behind each wall and linking each one to a separate audio client executing in a browser was deemed a sufficient solution. The audio client uses the Web Audio API to render sounds.

The audio client observes the same state and socket connections as other presentation clients. Each client watches the state of a particular gizmo associated with a given wall. A specific property of the gizmo changes from blank to an audio file name to tell the client to begin playing audio. Aspects of the audio playback such as repetition rate and when to stop are also controlled via gizmo properties.

3.2.2.4 Setup

Displaying full-screen browser windows on several wall-sized displays is the simplest way of simulating a room with smart wallpaper displays. At BBC R&D, two wall-sized back-projected screens are used, as can be seen in Figure 3.10. This prototype setup provides an effective platform for creating and evaluating potential smart wallpaper experiences.

Figure 3.10: BBC R&D's smart wallpaper prototype

3.2.3 Summary

This section documented both the many-step approach that was taken to inform the design of the simulated smart wallpaper system and the system that was designed and implemented. As stated previously, this work was undertaken in order to create an effective platform on top of which smart wallpaper experiences could be prototyped—and therefore studied in more detail. The remainder of this chapter documents the first such prototyped smart wallpaper experience and corresponding case study.

3.3 Initial case study

This section details a particular smart wallpaper experience prototyped and investigated as a case study. In this case study, the experience prototyped was an interactive children's game.

3.3.1 Context and motivations

Researchers have long studied playful interactive experiences for children over large displays. These include interactive storytelling environments like 'Madame Bovary on the Holodeck' [Cavazza et al., 2007], 'Narratarium' [Hayden et al., 2013], and 'Wheel of Life' [Davenport & Friedlander, 1995], which allow users to interact with virtual worlds projected onto large displays using gesture and speech. Such expe-

riences have even been adapted into commercial products like 'EyePlay' [EyePlay, 2011], a system allowing users to interact with graphics projected onto floors or walls. However, these sorts of experiences have rarely been studied in the context of the home. Indeed 'EyePlay' is advertised as an 'out-of-home media experience'. One exception is 'KidsRoom' [Bobick et al., 1999], which used large projected displays to simulate a child's bedroom, and then transform it into a 'fantasy land where children are guided through a reactive adventure story'. Given the trends in display technology as described in the introduction (section 3.1), it is important to continue this study of large interactive displays for children in the context of the home. This was one motivation for prototyping and investigating an interactive children's game played over smart wallpaper. Another motivation was to investigate a particular way of interacting with smart wallpaper: through a smartphone. The smartphone in particular was chosen for several reasons:

1. To test one of the principles of smart wallpaper: that it should be easy for a variety of devices to connect to it and to control it, in order to facilitate a wide range of options for user interaction. See subsubsection 3.2.1.3 for the full list of the principles.
2. To look beyond the natural user interfaces (full-body gestural or eye-tracking based, for example) that have been the usual mechanism employed to enable children to interact with large displays. This was partly because natural user interfaces can have issues [J. Nielsen, 2010], and partly because this mechanism of interaction with large displays has not been investigated before from a playful perspective.

These motivations led to the prototyping and investigation of a smart wallpaper children's game as a case study. This case study was a collaborative project, between the author, other colleagues from BBC R&D, colleagues from BBC Children's, and a doctoral intern from the University of Swansea. The prototyped game was designed with input from all project members, and implemented by the author and the doctoral intern. The exploratory study investigating the prototyped game was designed and run largely by the author, with help from colleagues at BBC R&D. The subsequent analysis and publication of that study was conducted by the author, with some input from colleagues at BBC R&D [Hoare et al., 2015]. The following sections document the project in more detail.

3.3.2 Game

The game itself is based on the popular game 'Hide and Seek' and involves characters hiding in a stylised landscape. This landscape is rear-projected onto the two wall-sized back-projected screens that make up smart wallpaper. Characters then 'peep'

from behind objects in the landscape. The aim of the game is to 'catch' characters using a smartphone camera. Specifically, players use an app on a smartphone to play the game. The app provides a viewfinder (seen on the left in Figure 3.11), and players must move the smartphone camera to position peeping game characters in the viewfinder. The app uses image recognition techniques to determine when players have positioned a character in the viewfinder. When it detects that a character has been positioned in the viewfinder, that character is then 'caught'. When all game characters have been caught, the game ends. There is no button pressing involved. To help players find characters, the characters make sounds. These sounds are spatially positioned close to where the character is hiding to give players an indication of where to look. Figure 3.11 shows the game in action.

Figure 3.11: The game in action

3.3.3 Study

3.3.3.1 Participants

A user study was designed and conducted to investigate the hide and seek game. The study ran over five sessions, with each session having at least one parent, and children between the ages of 3–6. Three of the sessions had sibling pairs, and two of the sessions had two parents. This equaled a total of 8 children (m=3, f=5) and 7 parents (m=3, f=4). Participants were rewarded for their time with each parent receiving an incentive of £40 Love2Shop vouchers for each child and themselves. Ethical approval for the study was applied for and granted by the University of Bath's Department of Psychology Ethics Committee (reference number 15–036) and consent to participate was obtained from each parent in writing.

3.3.3.2 Procedure

Each study session involved two plays through the game, followed by a semi-structured interview. Participants were met by the researcher on arrival and briefed on the nature of the study and what the study session would involve. Following this, the parent(s) were asked to read and sign a consent form. Participants were then taken through to the study space, which was equipped with the smart wallpaper living room setup. One child was then asked by the researcher to play through the game, with very minimal instruction. In the case of the sibling pair sessions, the elder child was the first to be asked. Parent(s) of participants were invited to help and encourage their children. Following the first play-through of the game, the child who had played was asked to 'teach' either the researcher or their younger sibling how to play the game, and to play through the game with them. After the second play-through, the children were given paper and coloured pencils and asked to draw their favourite part of the game. During this time, a semi-structured interview was conducted with parent(s). At the end of each session, parent(s) were handed a debrief sheet, including information about the study, directions about where to go for more information on the research, and contact details for the researchers. Video and audio data of each session was gathered for qualitative analysis.

3.3.4 Results

This section contains the qualitative research findings. The findings relate to both the general reaction of participants to the idea of large displays in the home, and to the specific experience of playing a game over such displays. The results are organised around six key themes. These themes were arrived at by transcribing the interviews with parents and splitting them into quotes, and noting down observations from the playthroughs of the game. Each quote and observation was then coded, with the codes used being generated throughout the process. A brainstorming session was then held between the author and colleagues at BBC R&D where the combination of generated codes was considered in order for themes to be generated and reviewed. The six key themes are: **overall reaction**, **shared experience**, **physical activity**, **immersive playspace**, **mixed reality**, and **familiar/ futuristic**.

3.3.4.1 Overall reaction

The initial reaction of many participants when walking into the study space was to make exclamations, with the parents in session 1 proclaiming '*Wow, that's amazing!*' and the children in all sessions making noises of excitement. Moreover, participants

could quickly see how smart wallpaper would fit into their own homes. For example, some made suggestions as to how it could be integrated immediately with their lives, with the parents in sessions 2 and 5 suggesting they could project it onto the walls of their living rooms. One parent in session 2 said '*If there was some way we could project this, a small projector or something like that that you could just switch on, we would put it on the walls in our house*'. On top of this, some participants expressed a desire to get the hide and seek game straight away, with comments including '*You could sell it as it is*' from session 4, and '*If this were available I would probably get it*' from session 5.

3.3.4.2 Shared experience

A game over smart wallpaper has the potential to be quite inclusive because it transforms the living room itself into a play environment—immediately involving everyone in it. Indeed, it was observed that parents in all sessions cheered on their children and shouted encouragements to them while they were playing the game. Furthermore, many parents found genuine enjoyment in the game—with several laughing at the noises made by game characters, for example. In other words, it appeared that a game over smart wallpaper fosters a shared experience between siblings and families—and could potentially do the same for any group who happens to be in a smart-wallpapered-room together.

The nature of the game is such that it was possible for people to play together: users can, for example, point out game characters to each other when they appear. Sibling pairs would often do this, with exclamations of '*There! There!*' and '*Over there, get that one!*' heard repeatedly in the sibling pair sessions, 1, 3 and 4. Parents were also occasionally observed (in sessions 2 and 4) getting up or suggesting help to their children with issues that they perceived their children were having. They would, for example, change a child's grip on the smartphone to remove fingers from a blocked camera lens, or suggest the child look for a button to tap. This suggestion, to look for a button to tap, is actually a misleading one as the game was designed to require no button pressing to make it easy to use for young children—this will be discussed in more depth as part of the theme *familiar/futuristic* below. Overall though, these observations build up a very clear picture that a game over smart wallpaper provides a shared experience.

The parents in all sessions made comments about how this kind of shared experience would be valuable, with comments including '*Now you've got tablets and stuff maybe parents don't spend as much time with their children, because it's easy to put them in front of something. So it'd be good to have something which gets them together and doing something*' and '*It's a really good idea, because families would be able to join in as well*'. The success of the experience is clearly not at the expense of single

player games though, with one parent remarking that tablets were '*ideal for when we're travelling*'. Perhaps this kind of shared experience would be an occasional event, a particular time when the family could come together and share a game. Having access to a system that could both achieve this and integrate with one's everyday life is clearly valuable.

3.3.4.3 Physical activity

Unlike many other digital games, a game over smart wallpaper provides an opportunity for users to engage in some physical activity. This is because the playspace in a smart wallpaper game encompasses a large area (an entire room), and gameplay can be designed to require movement to cover this area. We observed a great deal of physical activity, with, for example, children in all sessions ran across the room at least once to catch a game character that had appeared somewhere out of reach. Moreover, children in all sessions stood on their feet for the majority of the game and engaged their arms too. Having said this, the children in 4 out of 5 sessions had to be encouraged into movement by their parents at first. The study space had been set up to look like a living room, including a sofa, and children in all sessions would sit on the sofa until it became clear they could not play the game from there. At this point, children would either get up and begin to engage in physical activity, or (much more frequently) parents would encourage children to move from the sofa. As the game interaction was through the medium of a smartphone, it is possible that the children associated the game with the screen-based games they were used to at first. They would usually sit whilst playing a game on tablet/smartphone and so needed prompting to engage in the physical activity required by a smart wallpaper game. Nonetheless, once off the sofa, children in all sessions engaged in some physical activity.

Parents were particularly pleased about the physical activity element of the game. There were comments including '*Anything that gets them moving is great*', '*Instead of being stuck in one place they can be up on their feet!*' and one parent in session 3 said '*We've always made a point that on a tablet they're constantly sat there. This is miles better*'. The sentiment from parents is clear—a game with an element of physical activity is very positive, and a game over smart wallpaper certainly provides this.

3.3.4.4 Immersive playspace

One key observation that became apparent when looking at the data as a whole was the immersive quality of the game. This appears to be due to a number of things: the spatial nature of the playspace itself, the use of spatial audio sounds,

and the smart wallpaper prototype allowing the game landscape to be immersively projected at life-size. For example, we found participants would use the spatial audio sounds and their peripheral vision as part of the gameplay as they would do in real life. In one of the sibling sessions, it was observed that upon hearing one of the spatial audio cues (of a game character playing the trumpet), the younger sibling looked around sharply, pointed and shouted '*There!*' Similarly, observed children in both single sessions were observed looking around sharply at the sound of a noise or a movement in their peripheral vision. This natural interaction with a digital platform gives the game an immersive quality, and this is echoed in the comments from participants. For example, we heard the term '*really interactive*' being used by parents in several sessions, with many comparing this aspect of the game to using the Nintendo Wii. Participants would also directly comment on using their peripheral vision, with one child enthusiastically telling us they could '*see them* [game characters] *in the corner of my eyes!*' A child in a different session told us that they thought the smart wallpaper game was better than a tablet/smartphone game because '*it's massive, it's all around you, you can see all over it*'. This immersive quality comes as a result of the features pointed out above: the spatial nature of the playspace, the spatial audio sounds used, and the life-size projection of the game landscape. It is interesting to note that in many ways these features are unique to a game played out over large displays.

3.3.4.5 Mixed reality

Related to the theme *immersive playspace is* the theme *mixed reality.* As mentioned in the previous section, terms like '*really interactive*' and '*far more interactive*' were used by parents in many sessions, with several of those parents comparing the game to the Wii. Interestingly, parents in session 4 also compared the game to connected toys like the Furby[1], Skylanders[2], and AppMATes[3], and one parent in session 3 said '*They're* [the children] *starting to do a lot more involving things*'. This was particularly noticeable when looking at the data as a whole, as it appeared participants were reaching for some way of describing a mixed reality experience. The game clearly does provide a mixed reality experience—as described in the previous section, it requires a fuller use of your human senses (spatial hearing and peripheral vision) to interact with a digital game, and it is a digital game but played over what will be the real, physical walls of future homes. It was considered to be very striking that participants picked up on this, as it suggests that participants understood what smart wallpaper was; that it would eventually paper the walls of their home just as naturally as their wallpaper does now.

[1] http://www.hasbro.com/en-gb/brands/furby
[2] https://www.skylanders.com/uk/en
[3] http://www.appmatestoys.com/

3.3.4.6 Familiar/futuristic

One of the interesting things about this game is the fact that it appropriates a technology many are familiar with, the smartphone, and uses it as a portal to a more futuristic experience, a smart wallpaper game. As one parent in session 1 said '*Phones interacting with walls is pretty futuristic!*' It is an interesting way to approach potential future experiences. All participants were observed picking up the hide and seek game interaction very quickly and with very little intervention. It is theorised that this was down to the fact that a familiar technology was used as the portal to a futuristic experience. This familiarity means that users pick things up quickly, and it is possible to see meaningful results about futuristic experiences without getting too impeded by usability issues. Furthermore, the familiarity means that it is possible to debug usability issues using tried and tested guidelines for smartphone interaction. For example, a lot of children were observed (in sessions 1, 3, 4, and 5) tapping the smartphone screen, or tapping the game characters displayed on the smartphone screen. Additionally, as described in the section on the theme *shared experience*, parents were observed (in sessions 2 and 4) telling their children to look for a button to press. These are issues that could easily be mitigated using guidelines for smartphone interaction. Perhaps appropriating current technology as a portal to future experiences is a good way of gaining meaningful insights about futuristic experiences, without users getting caught up in the fragility of prototype interfaces.

3.3.5 Summary

Participants engaged with and enjoyed the hide and seek game, and they saw a lot of value in the smart wallpaper prototype on which it was built. Smart wallpaper brought a lot of value to the game that other platforms do not—in particular the opportunity for a shared and immersive physical activity, that mixes real and digital worlds. It is posited that homes with large displays will be able to provide a particularly valuable experience for young children and their families. More generally, this case study demonstrates that smartphones are a useful and effective interface to large indoor displays.

3.4 Conclusion

This chapter detailed the process of designing and building a system that could simulate smart wallpaper, so that smart wallpaper experiences could be easily prototyped and evaluated. It also detailed the first smart wallpaper experience prototyped and evaluated on top of that system—a game for young children based on hide and

seek. This case study demonstrated that smartphones could be a useful and effective interface to large indoor displays, and that there was value in the multi-screen experiences involving smart wallpaper. This spiked the interest of the researcher in the potential for other multi-screen experiences, as is detailed in the next chapter.

Chapter 4

Smart Wallpaper: A Companion Experience

4.1 Introduction

> *Alice and David enjoy nature programmes, with the BBC's* Springwatch *series of programmes a particular highlight—and they're excited to catch up on last night's episode of* Autumnwatch *tonight. They navigate to it, and hit play. As the title sequence begins, their wallpaper fades into a forest scene, providing a fitting background. They both settle in, excitedly. As the programme starts in earnest, large, card-like banners start appearing around the TV, showing them extra information about the animals being profiled, bonus production tidbits, presenter trivia, and more...*

Increasingly, as described in detail in chapter 2, television users are augmenting their TV experiences with companion screens. In 2012, Nielsen reported that 85% of mobile device owners used their device while watching TV at least once a month, with 40% of them doing it daily [Nielsen, 2012]. Broadcasters are 'eager to move with this shift in viewing behaviour' [Vinayagamoorthy et al., 2012] in order to provide new and different TV experiences, but how they should do so is not entirely clear. There have been several commercially successful 'play along' companion screen apps for smartphone and tablet [Channel4, 2012; Williams, 2013], with the companion app to Channel 4's Million Pound Drop seeing over a million downloads in its first three months. Of particular interest to broadcasters is the potential for companion apps that provide relevant extra content to a user while they are watching a television programme: 40% of people aged 35–64 use their personal devices to dive deeper into TV shows they are currently watching [IPGMediaLab, 2013], and complex streams

of accompanying statistics have been a fixture of sports broadcasts for years. Having said this, trials of apps that provide synchronised, factual information have yielded mixed results. For example, Vinayagamoorthy et al. reported that while users enjoyed the opportunity to explore extra content through a companion app, they could also feel overloaded when both the television and the mobile device demanded their attention at the same time [Vinayagamoorthy et al., 2012]. Furthermore, Dowell et al. found that users had difficulty with 'knowing where to look' when using a companion app [Dowell et al., 2015].

This chapter explores the possibility of delivering such services on the space *around* a television using a technology like smart wallpaper (see chapter 3). Using the space around a TV could mitigate previously reported issues with apps that provide synchronised additional content. Issues such as 'not knowing where to look' stem from users' attention not being directed appropriately across two screens users are typically not given any explicit indication as to when they should look at either the television or the companion screen. This is further compounded by the fact that the mobile devices used to deliver companion apps may be outside of the field of view of users (in their lap, for example) as they watch the TV. Hence, users do not always get an implicit indication of when they should look at the companion screen by seeing it update in their peripheral vision. Placing the companion content in the space around the TV places it more effectively in the field of view of the user, giving the user an implicit indication of when to look at the companion content, mitigating some of the problems around knowing where to look. Furthermore, as described in detail in chapter 3, using the space around the TV is increasingly viably possible. Display technologies are evolving, becoming larger in display area, thinner, more flexible, and consuming less power in operation. It has been hypothesised that this could lead to wall-sized displays being common in homes [Campbell et al., 2014; Vincent, 2015]. It is timely that we begin considering and evaluating interaction with such technologies in the home setting.

This chapter investigates how using the space around a TV to deliver synchronous companion content impacts user experience, given that such companion apps are traditionally delivered on a mobile device.

4.2 Related work

In a world of instant gratification, where niggling questions can be settled almost immediately with an Internet search, companion apps that provide auxiliary streams of information have been proven to be a particularly interesting area for broadcasters and researchers. Second screen companion experiences have been developed to add such auxiliary streams of extra information and media [Basapur et al., 2011, 2012], augment sports programming with games and statistics [Anstead et al., 2014; Cen-

tieiro et al., 2013], or to help TV users keep up with intricate narratives [J. H. Murray et al., 2012; Nandakumar & Murray, 2014]. In particular, Murray et al. saw a possibility for using second screens to aid viewers of modern dramas [J. H. Murray et al., 2012; Nandakumar & Murray, 2014]. With the growth of digital formats, dramas have grown in narrative complexity. Through the use of VOD services and web-based fan activities there is scope for events from past seasons to be current in viewers' minds, thereby allowing writers to create complex multi-episode, and even multi-series, arcs. But these more complex plots and larger casts of recurring characters can, however, leave viewers confused. Indeed, the HBO Go app [HBO, n.d.] offers a sidebar of extra annotations synchronised with the streamed content to help viewers of these complex dramas. A companion app was built by Murray et al. to perform a similar task, but on a second screen [J. H. Murray et al., 2012]. The app shows synchronised information in the form of character maps, relationship recaps and thematic recaps. Under testing, the app was described by participants as 'very helpful' and 'extremely useful' [Nandakumar & Murray, 2014].

However, as mentioned in section 4.1, trials of these kind of apps that provide synchronised, factual information have also yielded mixed results. Over the course of several studies [Basapur et al., 2011, 2012], Basapur et al. investigated augmenting TV content with a parallel 'feed' of additional media on a secondary screen (a laptop, in this case). In one study, a feed consists of related information (e.g. IMDB trivia, news stories, Wikipedia information), comments from social networking sites, and related multimedia (e.g. photos, music, videos) [Basapur et al., 2011]. It was reported by participants that the parallel feeds enabled their usual habit of searching for extra information on the Internet. One participant noted that they had developed the habit of watching TV whilst having their laptop out prior to the study, because of the urge to look up information. They found, however, that this meant they started started engaging with other activities and so became distracted. They found that the parallel feeds solved this issue, by taking over the laptop and providing plenty of extra information, therefore allowing them to pay greater attention to the TV programme. Other participants observed that the content from the feed seemed to cover everything they were thinking about searching for, and, as such, they didn't have to. A follow-up study yielded an interesting result, revealing that participants' enjoyment of the feeds of extra information was partly based around their 'lean-back' nature. The second screen experience in this study was similar in feel to that of the previous study, but in this case users created the feeds themselves as part of the experience [Basapur et al., 2012]. As the show was being watched, a feed was created—generated by the participants for their network of friends, who were encouraged to post the trivia, news headlines and multimedia themselves. This change, however, was revealed to be a large barrier to adoption. Participants considered creating the posts for a feed to be very distracting and therefore detrimental to their experience. This suggested aggregated feeds of extra information synchronised to a TV programme should be provided as a passive, 'lean-back' experience.

Eye-tracking studies have also revealed some of the issues that companion apps which provide extra information might have to contend with. In general, eye-tracking studies in TV environments have tended to focus on complex single screen scenarios. For example, Kallenbach et al. found that text displayed on TV alongside video content significantly influences visual attention [Kallenbach et al., 2007]. Josephson and Holmes showed that cluttered TV news screens similarly influence visual attention [Josephson & Holmes, 2006]. In a study of ESPN's screen containing six streams of full-motion video, Cummins et al. found that visual attention varied as a function of screen size, sports action and repeated exposure [Cummins et al., 2011]. Interestingly, they also found viewers quickly adopted coping strategies to direct their attention among the many pictures. Vatavu and Mancas reported a study of four simultaneously presented video screens, and found that the number of screens significantly affected visual attention in terms of, for example, gaze switching between screens [Vatavu & Mancas, 2014]. This previous research suggests that complex viewing environments heavily influence visual attention and also that users are forced to come up with strategies to cope with these complexities.

There have also been eye-tracking studies in TV environments with companion screens. Holmes et al. conducted a study investigating the visual attention of people viewing a drama or documentary programme and simultaneously using a dedicated app running on a companion screen [Holmes et al., 2012]. They reported that 30% of a person's visual attention was allocated to the companion screen, with the TV receiving 63% and the remaining 7% being directed off screen. Their results indicated that visual attention on the companion screen tended to spike when content on the companion screen was updated, and when the TV showed advertising content. However, they also found that there were few seconds without some visual attention on the companion screen; participants appeared to 'monitor' the companion screen for content changes, possibly interrupting the viewing of TV programming.

In a similar study, Brown et al. found that visual attention to the companion screen was around 22% [Brown et al., 2014]. Again, there were indications that visual attention on the companion screen spiked when companion screen content updated. Additionally, it was observed that shifts in attention from companion screen back to television appeared to be driven by audio from the TV. However, the researchers also noted some limitations of their methodology and the physical setup it enforced in particular. The companion screen (a tablet) had to be mounted, and in this position 'automatic updates would have been visible in peoples' peripheral vision'. This would not necessarily have been the case if the companion screen were handheld, as tablets usually are.

The 'monitoring' of both screens, and concerns over the companion screen being outside peripheral vision, represent a common problem in companion screen research how to manage a user's attention over two discrete displays. That is, if a user does not know when a companion screen will update, and the visual cues that indicate

an update are outside of their field of view, then it is likely that users will have to engage in on-going monitoring of both screens. This enforced monitoring strategy could arguably detract from user experience.

In summary, whilst companion apps that provide extra information could potentially be of great value to TV users, previous work in this area has identified a number of issues. These issues largely relate to struggles around users not being able to easily keep track of two streams of content or two screens. The work presented in this chapter seeks to investigate how some of these issues could be solved by simply displaying the synchronised companion content *around* a television, as opposed to on a handheld device. Displaying the content around the TV will necessarily provide visual cues to users, reducing the need for them to employ 'monitoring' strategies. Equally, as the required physical movement and device manipulation in this scenario is less than in a scenario with a handheld or laptop device, it is anticipated that this scenario will provide a more 'lean-back' experience. In other words, displaying parallel content in the same plane as the TV and contiguous to it, and therefore in the field of view of the user, could mitigate some of the reported problems in this area by more easily allowing users to keep track of multiple simultaneous streams of content.

4.3 Hypothesis

As described above, this chapter explores the possibility of delivering companion services on the space *around* a television. Specifically, this chapter aims to discern how using the space around a TV to deliver a companion experience impacts a user's experience when compared to a companion experience delivered more traditionally—on a tablet. Using the issues, and their theorised causes, reported in previous literature, two explicit hypotheses about this comparison were formed. These were:

H1 Delivering a companion experience around a TV as opposed to on a tablet induces less monitoring of the companion screen, since the content (and, in particular, content updates) are in the field of view of the user.

H2 Delivering a companion experience around a TV as opposed to on a tablet induces less mental workload in users, given the reduced monitoring as a result of **H1** above.

Thus, it is hypothesised that delivering a companion experience around a TV as opposed to on a tablet provides a better user experience due to the combined effects of **H1** and **H2**.

The study reported in the remainder of this chapter is an experiment designed and conducted to test these hypotheses.

4.4 Participants

The participants in the study were 16 individuals (7 males, 9 females, modal age range 18—25) recruited from staff and students (undergraduate and postgraduate) at the University of Bath. Recruitment was through advertisement on internal university noticeboards and mailing lists. All participants had normal or corrected to normal vision. No other participant eligibility criteria were applied. Participants were given £5 remuneration for taking part in the study. Ethical approval for the study was applied for and granted by the University of Bath department of Psychology (reference 14–182) and written consent to participate was obtained from each participant.

4.5 Design

The study itself was an experiment that followed a within-participants design, which was conducted with the researcher present at all times.

Within the experiment, each participant was shown two 8 minute 35 second video clips of the BBC television programme *Autumnwatch*[1] on a television screen, along with synchronised companion content to the particular clip on a companion screen. The companion screen was either a tablet device or a large projected display around the video. Figure 4.1 shows a representation of how this looked. The companion content took the form of card-like information snippets containing content suitable to the content of the video clip at the time when it appeared. Table 4.1 details the companion content. Thus, the independent variable was *companion screen type* with two levels: tablet or large projected display.

Specifically, each participant was exposed to the following two conditions:

- An 8m 35s video clip from *Autumnwatch* with dedicated companion content shown on a tablet device.
- An 8m 35s video clip from *Autumnwatch* with dedicated companion content shown on a large projected display around the video.

[1] *Springwatch*, *Autumnwatch* and *Winterwatch* are annual BBC television series which chart the fortunes of British wildlife during the changing of the seasons in the United Kingdom.

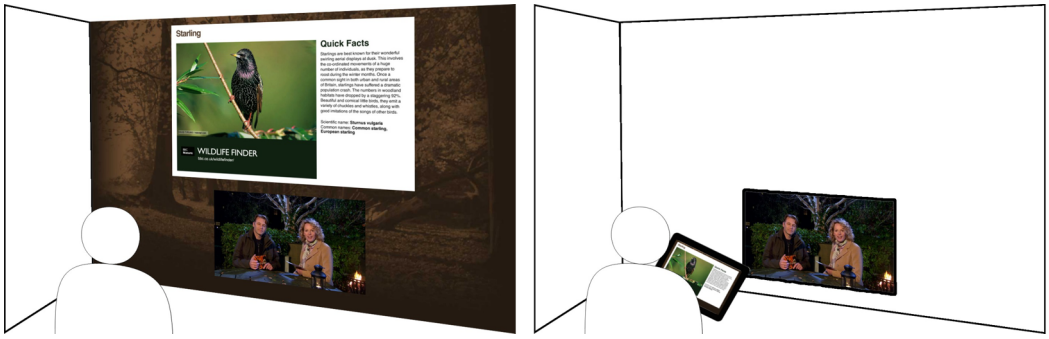


Figure 4.1: Representative diagram of the experiment.

To prevent fatigue effects, each participant was shown two different video clips. Thus, the order of presentation of both companion screen type and video clip was doubly counterbalanced to prevent order effects. Figure 4.2 shows the exact counterbalancing logic employed.

While the participants undertook each condition, a measure of the effect of the independent variable on the dependent variable *visual attention* was taken using a set of eye-tracking glasses. This measure of visual attention was taken in order to assess hypothesis **H1**, which hypothesised that delivering a companion experience around a TV as opposed to on a tablet would induce less monitoring of the companion screen (section 4.3). A mobile eye-tracking system (in the form of eye-tracking glasses) was chosen to gather the visual attention data, as opposed to a remote eye-tracking system, in order to maintain the handheld nature of the tablet companion screen. Specifically, a remote eye-tracking system would require the tablet companion screen to be statically mounted, which would dramatically detract from the usual handheld nature of a tablet - a key aspect of the hypotheses under test in this experiment.

Immediately after each condition, a measure of the effect of the independent variable on the dependent variable *mental workload* was taken. This measure of mental workload was taken in order to assess hypothesis **H2**, which hypothesised that delivering a companion experience around a TV as opposed to on a tablet would induce less mental workload in users (section 4.3). This measure was taken using the raw NASA-TLX, a rating scale with six sub-scales.

Additionally, after the participants underwent the second condition, a measure of the effect of the independent variable on the dependent variable *information recall* was taken. This measure of information recall was taken as an exploratory measure, to get a an impression of whether the reduced mental workload as a result of the hypotheses in section 4.3 allowed for users to retain more information. This was via a multiple-choice questionnaire of six questions. These questions related to the companion content only. Each question had four options, one of which was the

	Clip 1: Starlings	Clip 2: Dolphins and Trout
25s	*About starlings* An initial information snippet about the starling species	*About dolphins* An initial information snippet about the dolphins in the UK
1m 40s	*Identifying starlings 1* General information about recognising the starling species	*Dolphin locations* Information about where in the UK you can find dolphins
2m 30s	*Identifying starlings 2* Information about recognising juvenile starlings	*Dolphin facts - did you know 1* General trivia about dolphins
3m 30s	*Identifying starlings 3* Information about recognising starlings in spring	*Dolphin facts - did you know 2* General trivia about dolphins
4m 45s	*Identifying starlings 4* Information about recognising starlings in autumn	*About trout* An information snippet about the trout species
5m 47s	*Flocking starlings* Information about why starlings flock	*Trout habitat* Information about the habitat of trout
6m 25s	*Starling facts - did you know 1* General trivia about starlings	*Behind the scenes of filming 1* Annotated photos of the team filming this segment
7m 25s	*Starling facts - did you know 2* General trivia about starlings	*Behind the scenes of filming 2* Annotated photos of the team filming this segment
7m 50s	*Audience submitted starling photographs* A collection of photos of starlings from the *Autumnwatch* audience	*Audience submitted trout photographs* A collection of photos of trout from the *Autumnwatch* audience

Table 4.1: This table details the companion content shown to participants during the experiment. The time at which the companion content was shown is in the leftmost column, while a brief description of the content shown at that particular time for each clip is detailed the subsequent two columns.

option 'I don't remember'. Participants answered questions on the content of the second clip only. This test was taken as a between-participants measure to avoid any 'revision' effect on the user. TV experiences are usually a leisure activity so any recall test should be incidental and not expected by the participant. This is difficult to achieve in a within-participants design, hence the addition of information recall as a between-participants measure. It should be noted that the inclusion of the recall test as a between-participants measure meant that for sample size N there were N/2 measures of information recall for each condition (see Figure 4.2).

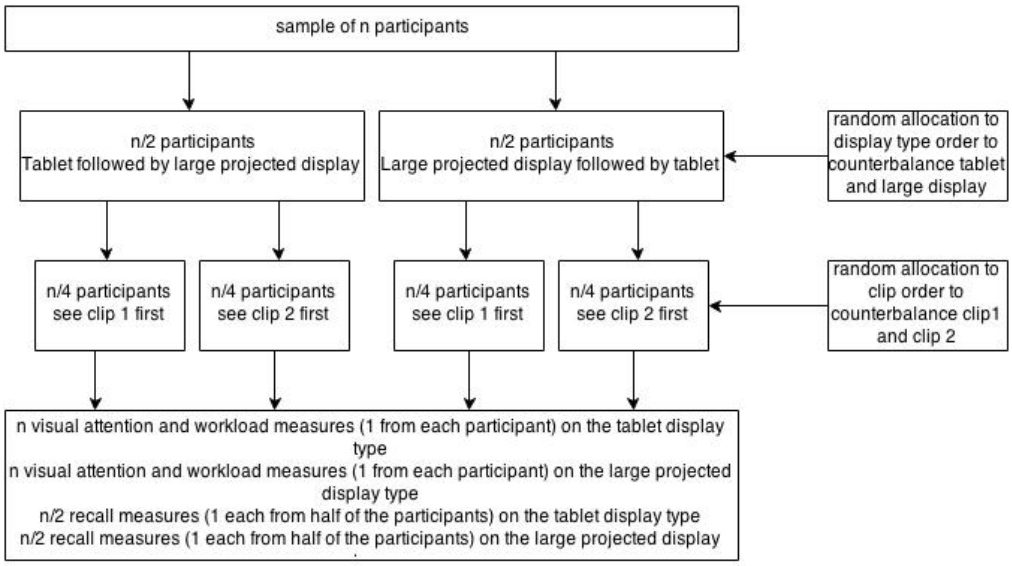


Figure 4.2: Experiment design and counterbalancing logic.

Thus the effect of the independent variable on the overall dependent variable of *user experience* was determined through measures of visual attention, mental workload and information recall.

4.6 Materials

Each session was run in one of the lab spaces in the 6W building at the University of Bath. Prior to each session with a participant, the experimental space was set up with the following materials:

Network-connected laptop A laptop, which was used to run the smart wallpaper system and to host the *Autumnwatch*-specific content. Specifically, the laptop needed the following resources/to act in the following ways:

Smart wallpaper source code The laptop required a copy of the smart wallpaper source code to run the smart wallpaper system. Note: to display any smart wallpaper 'walls' a projection display was needed in addition.

Act as a wireless router The laptop needed to act as a wireless router in order to run a small, controllable local network for the smart wallpaper system to run on—allowing devices on the local network to easily communicate with the system, as described in chapter 3.

***Autumnwatch* content** The laptop required a copy of the *Autumnwatch* content in order to show the video clips and to run *Autumnwatch* companion experience on both smart wallpaper and tablet.

Act as a 'wall' The laptop needed to run a browser to act as a 'wall' that would be displayed on a large projected display.

Act as a television The laptop needed to run a video player to play on a television screen that would be in front of the large projected display; thus acting as a television in both conditions.

Large projected display equipment A projector and projection screen to act as smart wallpaper, the companion screen in one condition.

Tablet device A tablet device to act as a companion screen in the other condition.

Television screen A television screen to play the video content in both conditions.

Eye-tracking glasses A set of eye-tracking glasses. The glasses used in this case were from SensoMotoric Instruments [SensoMotoricInstruments, n.d.].

Paper-based equipment Paper materials and a supply of pens/pencils. Appendix B contains all the paper materials used. The paper materials included:

NASA-TLX The raw NASA-TLX 'paper and pencil version' [NASA, n.d.].

Recall questionnaire The multiple-choice recall questionnaire.

Consent form The consent form and information sheet.

As well as being set up with this equipment prior to each session, the experimental space had normal domestic lighting levels, and was kept quiet at all times. Figure 4.1 shows a representative diagram of the experimental setup.

4.7 Procedure

Each participant was met by the researcher in the experimental space, and invited to sit directly in front of the television, where the video clip would appear. At

this stage, the participant was invited to read an information sheet explaining what the experiment would entail (the fact that the second post-clip questionnaire would include questions about the content was not mentioned). Following this, written consent and demographic details were obtained.

The participant was then set up with the eye-tracking glasses, which were then calibrated at this time. When the participant confirmed they were comfortable to continue, the researcher either handed the participant the tablet or turned on the large projected display, depending on the experimental condition. The researcher then started the first video clip. At the termination of the clip, the participant subjectively rated their workload using the raw NASA-TLX. This process was then repeated for the second clip, and the companion screen type. Additionally, following the second clip, the participant completed a short multiple-choice questionnaire about the content of the second clip's companion content.

Finally, participants were fully debriefed about the nature of the experiment and given the contact details of the researcher to take away. The total duration of each session was approximately 35 minutes.

4.8 Results

4.8.1 Visual attention

The following results, that pertain to participant visual attention, were arrived at in part by using the custom BeGaze software that ships with the SensoMotoric eye-tracking glasses used in this study. The BeGaze software allows for the definition of 'areas of interest' within a captured scene, which it then uses to generate detailed information with respect to those areas of interest. In this case, for each captured scene (i.e the view of each participant attending to the television and companion screen in both smart wallpaper and tablet conditions), two areas of interest were defined: the television screen and the companion screen. Information about these areas of interest could then be generated and exported by the BeGaze software. This information included: the time and sequence in which areas of interest were discovered by each participant, the total time attention was allocated to each area of interest over the course of the stimulus by each participant, the duration of the first fixation on each area of interest, the number of glances allocated to each area of interest, and so on. This information could then be statistically analysed. Further, the software could also then export the number and lengths of fixations allocated to each area of interest for each participant; information which could also then be processed and statistically analysed. This section presents these analyses.

The data gathered from the eye-tracking glasses showed that the TV screen had, on

average, the largest share of the visual attention in both conditions; i.e. both when the companion screen was smart wallpaper and when it was a tablet. Similarly, the companion screen had a far smaller share of the visual attention in both conditions. The TV screen received 72.59% of the total visual attention in the wallpaper condition, compared to receiving 62.38% in the tablet condition. The companion screen received 7.5% of the total visual attention in the wallpaper condition, versus receiving 12.31% in the tablet condition. This information is further presented in Table 4.2 and Table 4.3 for clarity.

	Average total visual attention allocated (ms)	Percentage share (%)
TV screen	373844.59	72.59
Companion screen	38629.65	7.5

Table 4.2: The average total visual attention (in ms) allocated to each screen (and the percentage share of the visual attention this amounted to) in the wallpaper condition.

	Average total visual attention allocated (ms)	Percentage share (%)
TV screen	321246.39	62.38
Companion screen	63382.91	12.31

Table 4.3: The average total visual attention (in ms) allocated to each screen (and the percentage share of the visual attention this amounted to) in the tablet condition.

While in both conditions the companion screen received a far smaller share of the visual attention than the TV screen did, there were differences between conditions. Firstly, the TV screen received, on average, a larger share of the total visual attention in the wallpaper condition than it did in the tablet condition. Similarly, the companion screen received, on average, a smaller share of the visual attention in the wallpaper condition than it did in the tablet condition. Paired t-tests were conducted to compare these differences in the average total visual attention allocated to each screen between conditions. Paired t-tests were chosen because, in the case of both the visual attention allocated to the TV and the visual attention allocated to the companion:

1. The dependent variable (total visual attention allocated to the screen in question) was measured on a continuous scale (ms) in both cases.
2. The independent variable (*companion screen*) consisted of two matched groups (*wallpaper* and *tablet*) in both cases.
3. The distribution of the differences in the dependent variable was approximately normal in both cases, as demonstrated by the non-significant Shapiro-Wilks

values in each case. In the case of total visual attention allocated to the TV the differences had a Shapiro-Wilks value of 0.550, and in the case of total visual attention allocated to the companion, the differences had a Shapiro-Wilks value of 0.438.

First, a paired t-test was conducted to compare the average total visual attention allocated to the TV screen across conditions. There was a significant difference in the average total visual attention allocated to the TV screen between the wallpaper and tablet conditions; t(15)=2.390, p=0.030, with a medium effect size (d=0.5975). In other words, the type of screen on which companion content was presented significantly affected how participants allocated their visual attention to the television. Secondly, a paired t-test was conducted to compare the average total visual attention allocated to the companion screen across conditions. Again, there was a significant difference in the average total visual attention allocated to the companion screen between the wallpaper and tablet conditions; t(15)=–2.477, p=0.026, with a large effect size (d=0.61925). That is, the type of screen on which companion content was presented significantly affected how users allocated their visual attention to the companion screen. These results are visualised in Figure 4.3.

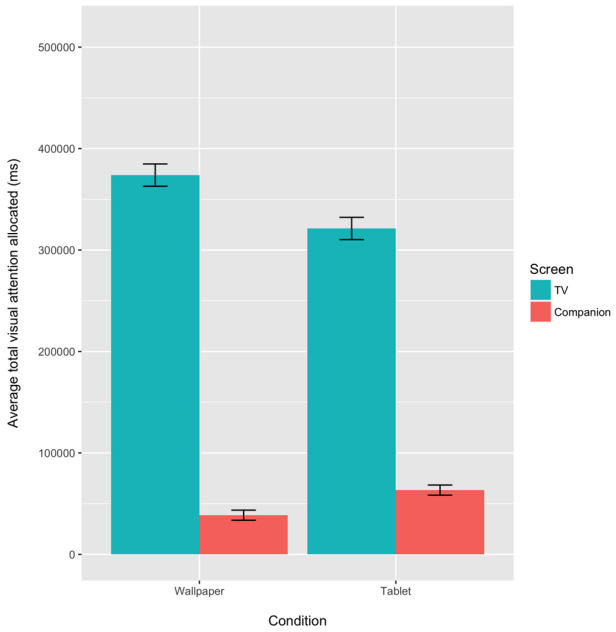


Figure 4.3: The total visual attention allocated to the TV screen and the companion screen in each condition. Error bars were calculated using Cousineau's method for representing error bars in within-subject designs [Cousineau, 2005].

Related to the total time participants spent looking at the TV and companion screens is the total time participants spent looking away from both of these screens, or off-

screen time. In the wallpaper condition, this time was found to be 127525.76ms on average, whilst in the tablet condition it was found to be higher at 155370.70ms. This difference, however, was shown to be non-significant after a Wilcoxon signed-rank test, p=0.121 (conducted as the differences in the off-screen time data were found to have significant outliers and were non-normally distributed).

The data gathered from the eye-tracking glasses also allows some insight into the nature of the visual attention allocated to each device in each condition. For example, it showed that, in both conditions, the majority of participants discovered the devices in the same sequence (television—>companion). The time it took for the participants to do that discovery, i.e. the time required for a participant to visually fixate both the television and companion screen at least once, was somewhat shorter on average in the wallpaper condition (at 21769.52ms) than it was in the tablet condition (at 39133.49ms). This difference, however, was shown to be non-significant after a Wilcoxon signed-rank test, p=0.255 (conducted as the differences in the discovery time data were found to be non-normal).

The two graphs shown in Figure 4.4 allow further insight into the nature of the visual attention allocated to each device. These graphs show how the visual attention varied over the course of the clip. They plot the percentage of participants attending each device (TV screen or companion) for each 500ms time slice. The TV is plotted on the upper half (0 to 100%), while the tablet is on the lower half (0 to 100%). Thus, high positive values indicate more attention on the television, with high negative values indicating more attention on the companion. The graphs are also annotated to show when there was a synchronous 'push' of content to the companion screen. In this way, the graphs show how the visual attention allocated to each screen fluctuated over the course of the stimulus for each condition, and gives an indication of how the synchronous 'pushes' of content to the companion screen affected that attention. The graph depicting this for the wallpaper condition is shown in the upper half of Figure 4.4, with the graph depicting this for the tablet condition shown in the lower half.

Looking at these graphs, it is clear that in the tablet condition, attention to the companion screen was sustained and evenly distributed over the course of the stimulus. This is in contrast with the wallpaper condition where it is possible to see some dramatic 'spikes' in the data. That is, in Figure 4.4 there are certain time slices when attention allocated to the TV screen suddenly drops considerably, while attention to the companion screen increases. These spikes correspond in time with a synchronous 'push' of companion content to the wallpaper.

Another way to gain insight into the nature of the visual attention is by looking at gaze lengths. A gaze length is defined as the length of time for which a fixation is detected on a screen for consecutive 500ms time slices. Figure 4.5 shows two frequency histograms which plot the gaze lengths detected on the TV screen on the

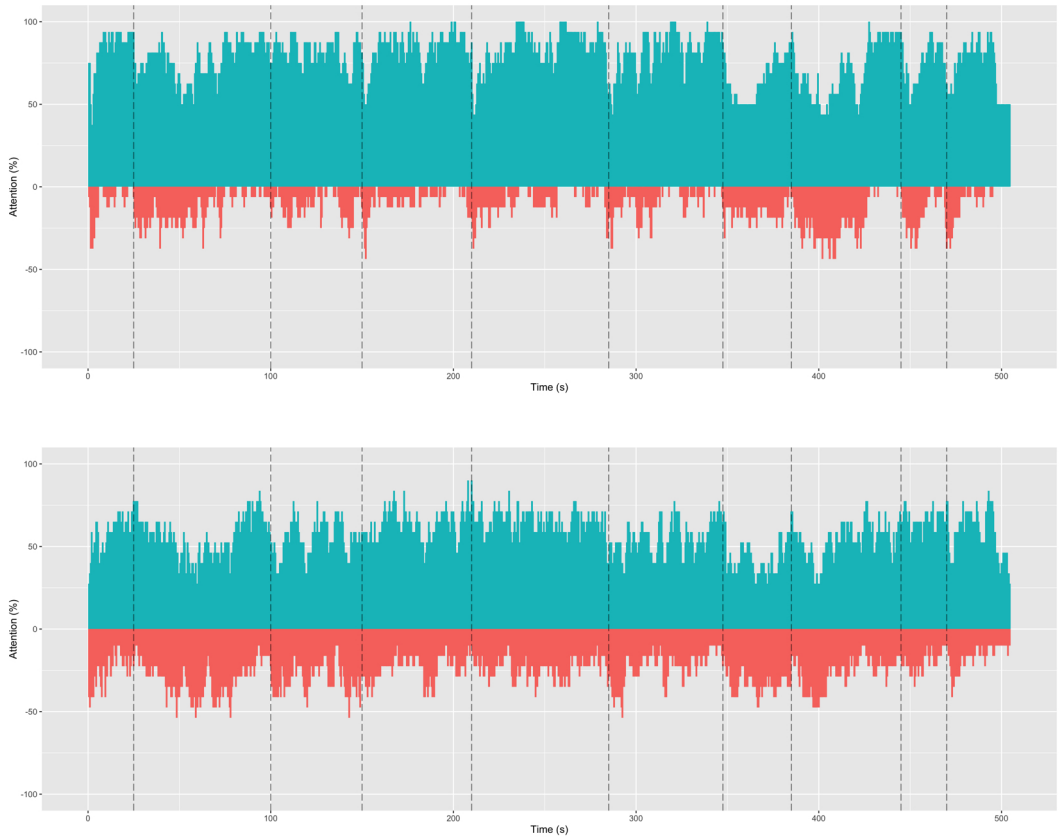


Figure 4.4: The split of visual attention between TV and companion over the course of the clip in the wallpaper condition (upper) and tablet condition (lower). The turquoise bars in the top half represent participants attending to the TV screen, the salmon bars in the lower half represents participants attending to the wallpaper. Synchronous 'pushes' of content to the companion screen are indicated by vertical dotted lines.

left, and on the companion screen on the right. The gaze lengths allocated to the companion screen follow broadly the same pattern across conditions, with a high number of very short gaze lengths that tail off quickly. In contrast, the gaze lengths allocated to the television screen are distributed differently across conditions, with far more shorter gazes allocated to the TV screen in the tablet condition, and lots more gazes of longer length allocated to the TV screen in the wallpaper condition.

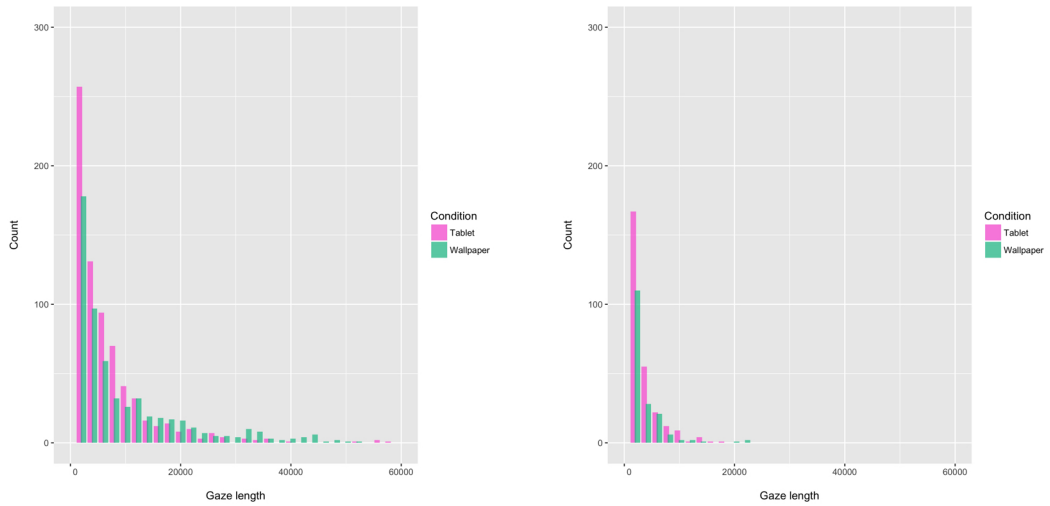


Figure 4.5: The lengths of gazes on TV and companion screens across conditions. The tablet condition is show in pink, with the wallpaper condition shown in green. The TV screen gaze lengths are shown on the left, with the companion screen gaze lengths shown on the right.

To assess the similarities and differences the plots in Figure 4.5 appear to show, paired t-tests were conducted on the average gaze length of each participant. Paired t-tests were chosen because the average gaze length data met all the necessary assumptions described above, with non-significant Shapiro-Wilks values (0.107 in the case of average gaze lengths on TV, and 0.149 in the case of average gaze lengths on companion). First, a paired t-test was conducted to compare the average gaze length allocated to the TV screen across conditions. There was a significant difference in the average gaze length allocated to the TV screen between the wallpaper and tablet conditions; $t(15)=4.104$, $p=0.001$, with a large effect size ($d=1.026$). In other words, the type of screen on which companion content was presented significantly affected the average length of gaze allocated to the television. Secondly, a paired t-test was conducted to compare the average gaze length allocated to the companion screen across conditions. There was no significant difference in this case, however ($p=0.419$). That is, the type of screen on which companion content was presented did not affect the length of gaze allocated to the companion screen.

4.8.2 Mental workload

As recommended by Hendy et al. [Hendy et al., 1993], the 6 scales of the NASA-TLX were combined into an estimate of overall workload, giving an interval value between 0–600, referred to as the raw NASA-TLX. The Wilcoxon signed-rank test revealed workload to be significantly greater when the companion screen was a tablet (median=200), as opposed to when the companion screen was smart wallpaper (median=110), Z=–3.519, p<0.001, with a large effect size (r=0.622). That is, the type of companion screen on which companion content was presented significantly affected the mental workload of users. Indeed, scores for all six of the NASA-TLX subscales were significantly greater when the companion screen was a tablet as opposed to when the companion screen was smart wallpaper: mental demand (Z=–2.42, p=0.016), physical demand (Z=–3.310, p=0.001), temporal demand (Z=–2.236, p=0.025), performance (Z=–2.130, p=0.033), effort (Z=–2.988, p=0.003), frustration (Z=–2.955, p=0.003).

4.8.3 Recall

When participants were able to remember content, they recalled with an average accuracy of 76.04% in the tablet condition, and 77.08% in the large display condition, whilst in both conditions the percentage of 'I don't remember' answers was 21.88%. An independent samples t-test yielded no significant effect of either display type on either the mean number of correct answers (t(14)=–0.424, p=0.678). An independent samples t-test was run as the data was approximately normally distributed, with Shapiro-Wilks values of 0.283 and 0.408 in the case of the correct answers. It is interesting to note that while the display type of the companion content significantly influenced visual attention, with participants allocating less of their attention to the companion when it was smart wallpaper, it did not significantly effect how much information was taken in.

4.9 Discussion

Holmes et al. reported that during a second screen experience, participants would 'monitor' the second screen for content changes, interrupting the viewing of TV programming [Holmes et al., 2012]. The visual attention results from this study indicate similar behaviour in the tablet condition. Figure 4.4 shows that there were few seconds without some activity on the tablet. Equally, when comparing the two graphs in Figure 4.4, it can be seen that in the tablet condition visual attention was much more sustained over the course of the experience. This indicates that participants adopted a monitoring strategy in the tablet condition, but not in

the smart wallpaper condition, proving **H1**. In addition, the recall of information was the same across conditions despite the differences in visual attention patterns between conditions. This could indicate that the visual attention patterns are down to factors other than attending to and processing information, such as monitoring.

The monitoring may be induced by a lack of 'cueing' in the tablet condition. That is, given that companion content is synchronously pushed to the second screen, users are often left not knowing when the next push of content will arrive. This not knowing is mitigated in the smart wallpaper condition; content arrives in the participants' field of view, and participants know that will alert them. Expressly, the tablet condition enforces a disruptive monitoring behaviour, but the smart wallpaper condition does not. It was hypothesised that the enforced monitoring in the tablet condition would induce a higher mental workload in that condition, and it was certainly true that mental workload was significantly higher in the tablet condition, proving **H2**.

Considering these results, it is possible that the enforced monitoring and resultant higher mental workload detracts from the user experience of a synchronous companion screen experience, as per the overall hypothesis. Indeed, in informal conversations with the researcher, participants described the smart wallpaper experience as 'relaxing' and saying that they enjoyed 'just sitting back and relaxing'.

It is possible, however, that the monitoring strategy seen in the tablet condition was present due to poor orchestration of the companion content, because little thought had gone into how exactly to orchestrate the experience over two screens. Smart wallpaper does a good job of orchestrating attention over two streams of content by simply putting the two streams into the field-of-view of the user, and therefore providing content change 'cues' in their peripheral vision, but this mitigation does not deal with the underlying problem of orchestration. In other words, future work should involve a more thorough investigation of orchestration over two streams of content.

4.10 Limitations

The limitations of this study centre around the nature of the experience under study, a television programme. For example, one particular limitation is the genre of the television programme and the subjective preferences of the participants for that genre. This is a usual consequence when studying television experiences, however.

Furthermore, watching only a short clip of a television programme is not the usual way users would watch a television programme, detracting a great deal from the ecological validity of the study. Indeed, watching a television programme in a lab space, whilst wearing large eye-tracking glasses, also detracts from the ecological

validity of the study. Ecological validity is a particular challenge for studies of this nature—studies that are concerned with leisure activities.

4.11 Conclusion

The study presented in this chapter sought to explore the possibility of delivering companion services on the space *around* a television. Specifically, this chapter aimed to discern how using the space around a TV to deliver a companion experience impacts a user's experience when compared to a companion experience delivered more traditionally—on a tablet. There were several positive results indicating that, in fact, using the space around a TV to deliver a companion experience positively impacts a user's experience when compared to a companion experience delivered on a tablet. Indeed, the hypotheses set out in section 4.3 were fulfilled. However, as discussed in section 4.9, future work should involve a more thorough investigation of the orchestration of companion experiences.

Chapter 5

Television and Additional Media: A Taxonomy

5.1 Introduction

The definition of a 'television experience' is evolving due, in part, to the ever-increasing range of available consumer devices and the ubiquity of the Internet. One way it is evolving is through the supplementation of a television programme with additional media activity. Indeed, the experience studied in detail in chapter 4 demonstrates one potential way of supplementing a television programme with additional media. Whilst that experience involved a dedicated stream of companion content running on a wall-sized display, such supplementation may comprise many other activities, as has been seen previously in this thesis in the literature (chapter 2). Such activities can also include, for example, checking emails while watching a television programme, using a dedicated play-along app, or catching up with the latest fan theories for a particular show before its next episode. These use cases clearly reflect a wide range of different user motivations and as such require distinct consideration. For researchers, designers, and programme makers, an important prerequisite to this is having a language and terminology to adequately describe the different additional media activities that supplement television programmes.

Currently, researchers use a small set of terms to describe the diverse range of additional media activities that users engage in relative to particular television programmes. This can make the body of work in this emerging field hard to interpret, and can mean that the same terms are used to describe additional media activities that are actually very different in nature. This leaves the body of work open to the drawing of potentially erroneous generalised conclusions.

The terms used have included 'second screen' [Schirra et al., 2014; Neate et al., 2015; Geerts et al., 2014], 'second screening' [Doughty et al., 2012; Courtois & D'heer, 2012], 'second screen experience' [Basapur et al., 2012; Torpey & Bloomberg, 2014], 'media multitasking' [Brasel & Gips, 2011; Brumby et al., 2014], 'companion content' [Schirra et al., 2014; Brown et al., 2014] and 'companion experience' [Basapur et al., 2012; Nandakumar & Murray, 2014], amongst others. As stated, these terms do not necessarily refer to what is expected—and common sense conclusions on the distinctions between the terms are dangerous to draw, given that single terms have been applied to very different additional media activities. For example, Schirra et al. use the term 'second screen' to refer to the live-tweeting of a television programme [Schirra et al., 2014], whereas Neate et al. use it to refer to a dedicated application designed and built to accompany a specific programme [Neate et al., 2015]. Whilst the use of this term makes sense for each example in its own context, each example is very different. In the interest of clarity, a well-defined set of terms would be helpful to categorise the range of additional media activities that users engage in to supplement television programmes.

There have been a handful of previous attempts made to define the meaning of particular terms. The '2nd Screen Society', an industry body, has provided a 'lexicon' of terms and their definitions, although it is relatively unstructured [2nd Screen Society, n.d.]. Furthermore, some of the terms overlap and even appear to contradict one another. For example, the lexicon states that the definition of a 'second screen' is:

> A companion experience in which a consumer engages in relevant content on a second device, such as a smart phone, tablet or laptop while watching something on the 'first screen' (typically a television but not limited to the living room). [2nd Screen Society, n.d.]

That the definition of a 'companion experience' is:

> A second-device activity that is specially designed, by the creator of the first screen content (or service provider partner), to enhance the entertainment experience or viewing outcome. This extends to any experience provided by the TV industry that acts as a counterpart to your TV consumption, delivered on a second screen. [2nd Screen Society, n.d.]

And that 'second screening' is:

> The broadest definition of second screen use, this covers any second-device activity undertaken while watching TV or a live event While

> watching a TV program, viewers may be writing an email on a laptop, looking up sports results on a smartphone, or reading the news on a tablet: this is the 21st century version of reading the paper while watching TV. [2nd Screen Society, n.d.] [sic]

It is clear that the terms 'second screen' and 'second screening' represent quite different behaviours and scopes according to the 2nd Screen Society definitions—though they sound very similar.

McGill et al. in their review paper of 2015 catalogue a wide range of terms in use [McGill et al., 2015]. They reference a 2012 report from Google on the 'new multi-screen world' [Google, 2012], which uses the terms 'multitasking' and 'complementary usage'. Google use both terms to refer to using one or more devices at the same time as watching television, with 'multitasking' referring to unrelated activities and 'complementary usage' referring to related activities. However, this particular use of the term 'multitasking' is somewhat misleading—clearly using one or more devices at the same time as watching television is a multitasking behaviour, regardless of whether or not the activities are related to the programme being watched. Indeed, elsewhere the term is used to refer to both related and unrelated activities [EricssonConsumerLab, 2013].

Ofcom recently introduced the terms 'media-meshing' and 'media-stacking' to refer to the additional media activity of users while watching television [Ofcom, 2013], with 'media-meshing' meaning interacting with (or communicating about) content related to the television show, and 'media-stacking' meaning engaging with content unrelated to the show. These terms, whilst not yet widely adopted, are clearer than some of the other terms in use. The phraseology of the terms has a clear relationship to the activities they represent and are plainly differentiable from each other. However, the terms do not entirely cover the kind of granularity needed to adequately describe the full range of additional media activities that users engage in relative to a particular television programme. For example, there is a considerable difference between reading an IMDB webpage about a programme you are watching and interacting with a dedicated app designed to accompany it—though both would correctly fall under the term 'media-meshing'. So whilst the terms 'media-meshing' and 'media-stacking' are certainly the most useful, it is necessary that more granular terms are introduced for accuracy.

In an attempt to improve on the current state of affairs, the work detailed in this chapter aims to develop a language and terminology for researchers and practitioners to effectively describe additional media activities that users engage in to supplement television programmes. While most of these media activities are understood in their own right, their relationship to television programmes is not yet well understood, necessitating a useful language and terminology. The work detailed in this chapter aims to develop such a taxonomy, and was developed and published in collaboration

with a fellow PhD student at BBC R&D [Hoare & Hinde, 2016].

5.2 Examples of additional media activities

To demonstrate the diversity of additional media activities that a user may engage in relative to television programmes, this section presents several imagined 'user journeys'.

Juan is watching a historical drama (the BBC's adaptation of Wolf Hall[1]*) and has installed an app on his tablet that was custom-built for this particular series. He likes learning more about the historical events and artefacts he sees in the show—and this app delivers that information to him at appropriate moments throughout the programme for him to peruse. For example, when some characters display shock at the rise of Thomas Cromwell, the app immediately delivers some information about the unlikelihood of a lawyer rising so high in Tudor times. As well as delivering this information to Juan while he is watching the programme, the app also archives all the information so that when the show has finished, and while Juan is waiting for the next programme in the series, he can use the app to have another browse of all the content that has been delivered so far.*

Stephanie is watching a current affairs programme, where several political figures are debating issues of the day. She tends to monitor the 'Top Tweets' on the hashtag provided at the start of the show on Twitter while she's watching, so she can see people's reactions to the debates.

Liam is watching a nature programme about the Arctic Ocean and navigates to the Wikipedia page of beluga whales on his smartphone to get a bit more depth of information about how they have evolved.

Jess is a massive fan of Sherlock[2] *and she's been waiting all year for the new series to begin. In the week before the series premiere, she sees that the blog of fictional character, Dr John Watson, has been resurrected and so she reads through his new posts in anticipation of the programme.*

Before she goes to bed, Shachi is catching up with the news on her TV, and dealing with a few emails on her laptop at the same time.

Alice and David are watching Autumnwatch. *As the title sequence begins, their smart wallpaper fades into a forest scene, providing a fitting background. As the*

[1] *Wolf Hall* is a BBC historical drama, see http://www.bbc.co.uk/programmes/p02gfy02.

[2] *Sherlock* is a BBC television drama about a fictional detective, see http://www.bbc.co.uk/programmes/b018ttws.

programme starts in earnest, large, card-like banners start appearing around the TV, showing them extra information about the animals being profiled, bonus production tidbits, presenter trivia, and more

5.3 Categorisation of additional media activities

Additional media activities relative to a particular television programme can be described by their content, when and how they are experienced, and the degree to which they have been orchestrated.

Before moving on to describe how additional media activities will be categorised, it is worth highlighting a couple of points. Firstly, it is important to clarify the way in which this taxonomy considers the term 'experience'. The term 'experience' could be used as an encompassing term to refer to a user's entire experience of a television programme, including both the programme itself and any additional media activities undertaken by the user. It could also be used to refer to each component part of the user's entire experience of a television programme. For example, the viewing of the television programme could be considered to be an experience in and of itself, as could each individual additional media activity. As an example, consider the case where a user begins their experience by watching a particular television programme. They then simultaneously use their tablet to navigate to the Wikipedia article for a particular character in the television programme, before moving on to check their social media accounts. Finally, they decide to look up the IMDB page for the programme they are watching. Thus, the user's experience has encompassed the experience of several different additional media activities and could continue to do so. As we are considering the categorisation of separate additional media activities on an atomic level, this document uses the term 'experience' to refer to the experience of each separate additional media activity—though it is acknowledged that the term can also be used as an encompassing term.

Secondly, it is important to note that additional media activity, within this context, refers to activity not required by the user to experience the main programme in its standalone form. It should be clear, therefore, that conventional use of accessibility services (e.g. subtitles and audio-description to supplement information a user may otherwise be unable to access in the programme) is beyond the scope of this classification. Within this document, the use of these services is considered as part of the main programme itself.

5.3.1 Relatedness

The first way that an additional media activity may be categorised is by considering the relatedness of the additional content being experienced. Indeed, existing terminology has attempted to capture this in the past, with related and unrelated activities featuring in some of the previously defined terminology presented in the introduction [Google, 2012; Ofcom, 2013].

In many cases the related nature of content may be clear to all (e.g. a webpage about the episode being watched). In other cases, however, the link may only be clear to the user (e.g. looking at information about a location that the user was reminded of as a result of a scene in the programme). Furthermore, additional content experienced both before and after the main programme may be considered related by the user. A user, for example, may hear a radio segment about a new television programme before deciding to watch it and then, after watching the show, read fan-site forums. It is, therefore, proposed that additional media activities are categorised based on the user's perception of the relatedness of the additional content at the time that they experience it.

There is one situation which may arise occasionally: the situation where a user may realise that content which they had consumed at an earlier date is related only during their experience of the main programme (e.g. 'this programme reminded me of the article I read last week'). For completeness, and given that additional media activities are categorised based on the user's perception of the relatedness of its content at the time that they experience it, this work categorises such cases as being unrelated.

5.3.2 Causality

Another way of categorising additional media activities is by considering the causality of the additional content: has the additional content been created or curated as a result of the television programme? Some content may have been created as a result of the main programme, while other content may have been produced irrespective of the main programme's existence. Content produced as a result of the main programme may be from the persons involved within the creation of the main programme itself, from third party organisations, or from other members of the public. It may include promotional materials (such as adverts, official websites and apps), or unofficial websites and apps from third parties, or even social media posts from other users.

It is important to recognise that there are many scenarios in which the creator of accompanying media (e.g. a website or app) may borrow from, or reference, pre-

existing resources—resources that were not created or curated as a result of the television programme. These resources may have no causal link with the main programme but be included as elements within an experience that was created specifically for the show. This curation is, in itself, an important distinction. Whether performed by human selection or algorithmically, this curated experience may be contrasted to non-curated experiences in which a user accesses resources which were not curated as a result of the main programme.

Curated experiences may be re-packaged to make it practically impossible for the user to distinguish information with no causal relationship with the main programme and content which was created as a direct result of the show. The taxonomy, therefore, does not distinguish between curation and creation, and divides content based on whether or not it was created/curated as a result of the show. Here, examples in which the content was created or curated due to the existence of the main programme are referred to as companion content. Within companion content, no distinction is made between automatically curated content and curation that is performed by a person. The perspective of the work is that by seeding the automatic curation system (e.g. creating a hashtag, specifying a search term or user-group to collect data from) a curatorial step has been taken. Furthermore, the process of curation is, in many cases, unlikely to be apparent or important to the end-user.

Companion content is contrasted with non-companion content, in which neither the curation nor the creation was due to the show. Within the taxonomy, the companion/non-companion distinction is only made for related content. It is theoretically possible that a user may not be aware that content is related to a show despite the content having been curated or created as a result of a show. This distinction is not useful, however, as from the user's perspective they are equivalent.

5.3.3 Synchronicity

Another factor at play is the question of when an additional media activity is undertaken by the user. If the user undertakes additional activity at the same time as they are watching a particular television programme, then the experience they are having is synchronous. If the activity is undertaken not at the same time, then the experience is asynchronous. This factor has been somewhat captured in existing terminology, with terms like 'simultaneous usage' [Google, 2012] or 'multitasking' [EricssonConsumerLab, 2013] employed, but the asynchronous use case has gone largely unconsidered in the field.

Whilst this distinction is largely clear, there is some complexity that should be noted. Consider, for example, the case where a user pauses a programme during a synchronous experience to engage further with the additional content, or the case where a user continues with their additional activity after the programme has fin-

ished. It could be argued that in the first case, the experience as a whole is still a synchronous one—despite the user pausing the programme for a period—as the expectation is that the user will un-pause the programme when they have completed this activity. Indeed, in the second case, the same could be argued if the user is simply finishing any activity they had undertaken. However, if the user ends one activity and then begins another—such as finishing one article on Wikipedia and then beginning another—it could be argued that the user has ended a synchronous experience and begun an asynchronous experience. This complexity in the distinction of an experience as either synchronous or asynchronous applies to edge cases only—as stated above, the distinction is usually clear. It is noted here in the interest of completeness and to recognise that a certain degree of common sense is required when classifying edge cases.

This stage of the categorisation, therefore, relates to the manner in which the user has chosen to experience the content: either synchronously or asynchronously. This taxonomy is primarily concerned with classifying those additional media activities that are undertaken by the user synchronously, as these activities are particularly variable and require further classification. It is, however, important to note the asynchronous use case.

5.3.4 Orchestration

Synchronous companion experiences may comprise applications that were built by someone other than the user with the express purpose of being experienced while watching the show (e.g. a play-along application). Alternatively, a synchronous companion experience could comprise general purpose resources that were created to be accessed in a wide range of scenarios (e.g. an IMDB page about the show). Within the taxonomy, these are referred to as orchestrated and improvised experiences, respectively.

The term orchestrated has, like many of the other terms used in this taxonomy, been used to describe experiences in the past. BBC R&D specified that 'orchestrated media' referred to the interaction, synchronisation, and collaboration of television programme and companion content across devices [Kramskoy, 2011]. It is used in a similar fashion in this taxonomy to classify those synchronous companion experiences that exhibit such features. The term improvised, though it has not been used in the field previously, is a useful counterpart to the term orchestrated—and can be used to effectively describe other, unorchestrated synchronous activities.

With orchestrated experiences, specific knowledge of the use case in the design stage allows for considerations of the user's context within the show and, therefore, it is likely that the experience will be more tightly related to the context of the episode and even scene. This may also allow the creator to produce an experience that

better complements the programme without risk of excessive distraction or spoilers. Furthermore, within an improvised experience, the user constructs their own experience of the show. This is a clear contrast to an orchestrated experience, in which the orchestrator has designed the experience for them.

Orchestration may take several different forms. For example, a programme may provide a 'hashtag' for users to engage with during the programme or tell participants to go to a specific web-poll during the course of the programme. Orchestration, however, does not have to be performed by the programme-maker or their associates. A user-generated hashtag created for discussion of an element within an ongoing show is still considered orchestrated. It is notable, therefore, that explicit calls-to-action are not a necessary requirement of an orchestrated experience. They are, however, a strong indication that orchestration has taken place.

Orchestrated experiences may vary in terms of the amount of control exerted by an orchestrator upon the coordination of additional content. The orchestrator may produce a 'locked-down' package of content to accompany an episode. In contrast, they may produce an experience that incorporates different content depending on when the programme is viewed. One example of this would be the orchestrator automatically aggregating content from an external source (e.g. UGC) that fulfils some defined criteria. An orchestrator may apply different degrees of control over the content, ranging from a basic search aggregation to a manual review and editorial. This factor, therefore, may be considered to be a scale with experiences in which the orchestrator exerts full control over content at one extreme, and experiences in which the orchestrator exerts minimal control at the other.

Orchestrators may also choose to control the time at which a user experiences additional content. Again, the orchestrator is faced with a scale of control. At one extreme an orchestrator may wish to take precise control over the time that content is presented to the user, so that it reaches them at an optimum moment. Conversely, an orchestrator may choose to hand over all control of the timing to the user. Again, intermediate points exist where the orchestrator may control the timing of collections of information that the user is able to navigate at their leisure.

It is, therefore, proposed to categorise media activities based on the presence of an orchestrator for the experience. By definition, orchestrated experiences consist of content that has either been created or curated for the show, and are therefore also companion experiences. This distinction of orchestration, however, is based on whether the way in which a user chooses to experience it was explicitly intended. To demonstrate this contrast, consider a website that has been built to accompany a series that is populated with content such as character profiles, behind the scenes footage etc. Synchronous use of the site would not be orchestrated as the site was not created with the express purpose of providing this experience. Conversely, if the site was to provide information specifically to be experienced during the show such

as social media conversations about the ongoing programme, this is both companion content and orchestrated.

Within orchestrated content, a distinction is made regarding how fully defined the additional content is by the orchestrator. Though it has been recognised that this factor exists on a scale, two categories are defined. Time-invariant produced packages of content are referred to as fixed experiences, while all other instances are referred to as evolving. To illustrate this division, consider an application that provides the user with specially selected photos to look at during a show. If the content of the application would be the same if a user were to watch the same programme a year later, then the experience is fixed. If, however, the images are selected periodically from the most highly-rated on a site, this would be considered an evolving experience.

A further step of categorisation refers to the degree of control the orchestrator has taken over the timing of content within the experience. Again, while it is acknowledged that different levels of control may be taken by the orchestrator, three distinct categories are put forward. Where each element of content is delivered at specific points decided by the orchestrator this is referred to as scheduled. Where the orchestrator has not taken any control of timing (i.e. the user is in full control of when content is experienced), this is referred to as unscheduled. Experiences which fall between these extremes are considered partially-scheduled. An example of such an experience could be an experience where the content is delivered in 'chapters', one after each commercial break. While the timing of the chapter delivery is controlled by the orchestrator, the user is given control over when to access elements within each chapter.

5.3.5 Devices

One manner in which additional media activities may vary is in terms of the devices used and, by extension, the modalities that they exploit. For example, one may distinguish between additional media that is presented on the same screen as the device (e.g. TouchCast[3]) and those additional media activities that occur on an extra device (e.g. playing a game on a phone while watching the television).

It is, however, also important to think beyond screen-based activities. With the current interest in the development of connected objects, there is the potential for media experiences that involve Internet-of-Things (IoT) devices. Such experiences offer the potential for ever-more creative additional media activities that escape the confines of the screen (e.g. a toy that acts out action from the programme [Evans & Jolly, 2013]). Furthermore, users may require or choose to undertake additional

[3]TouchCast, a way of creating video with rich, interactive elements, see https://www.touchcast.com.

media activities in different modalities (e.g. audio or braille) either due to access needs or preference.

Though device and, by extension, modality are factors that could be considered within a taxonomy they are not included within this work for several reasons. Firstly, as an emerging area there is a lot of potential in terms of devices and modalities that have yet to be explored. It therefore seems premature to impose a structure upon them. Secondly, the removal of device and modality from the taxonomy is to demonstrate the importance of developing equivalent experiences for those with different access needs and device limitations. It is hoped that by doing this it will encourage practitioners to consider the design of such equivalence in future experiences.

It is recognised that not introducing device or modality into the taxonomy is not without issue. Devices and modalities clearly have different sets of limitations and, therefore, design considerations. Furthermore, experiential differences may be significant to the user. Content that may work well in one modality may require alterations to be suitable for another (e.g. made shorter, timed or ordered differently). It should, therefore, be clear that their omission from the taxonomy does not mean device and modality do not require reporting or consideration at a later point.

5.3.6 User activity

The amount that a user is actively involved in the experience may also vary considerably. One can envisage scheduled orchestrated experiences that simply display information to the user and require no interaction. Conversely, play-along applications may require considerable user interaction. There are also a host of intermediate conditions requiring some interaction. An interesting case is social media activity, which can encompass both extremes, with some users choosing to watch the conversation and others choosing to actively engage with it [Pagani et al., 2011].

From this it is clear that user activity is a continuum. In a similar manner to devices and modality, user activity is not considered as a categorisation step within this taxonomy, but highlighted as a modifying factor that is important to report.

5.4 Taxonomy structure

A structure is provided for the classification of additional media activities based on the factors introduced in the previous section (see Figure 5.1).

The first categorisation step distinguishes between related and unrelated content. Related content is then further divided into either companion or non-companion content. This step is omitted from the unrelated branch because, given the user considers the content to be unrelated, its curation or creation is inconsequential.

A categorisation is then based on whether they are experienced synchronously or asynchronously. This applies to all branches, as users may choose to access any of the content types at any time relative to the programme. Synchronous companion content is then categorised further based on orchestration, as either orchestrated or improvised. For non-companion content or unrelated content, however, the synchronicity is the final classification, as they are implicitly improvised. As this work is concerned primarily with synchronous use, further categorisation of asynchronous experiences is not recommended here.

Orchestrated experiences are then categorised further based on the amount of control taken by the orchestrator. First they are categorised as fixed or evolving and then how scheduled they are. They are then categorised as either scheduled, partially-scheduled, or unscheduled.

5.5 Categorising the examples of additional media activities

To demonstrate the taxonomy, the examples given earlier are categorised in this section.

Juan's experience of using a custom-built app while watching a historical drama would be categorised as an orchestrated, synchronous companion experience. It would further be described as fixed and scheduled. If Juan chooses to browse the app between programmes as described in the user journey, then that experience would be categorised as an asynchronous companion experience.

Stephanie's experience of using Twitter while watching a current affairs programme would also be considered to be an orchestrated, synchronous companion experience. This one, however, would be categorised as evolving and unscheduled. The fact that Stephanie is looking at the 'Top Tweets' on a particular hashtag shows that the content she is viewing has been both created (by users of Twitter) and curated (by the 'Top Tweets' algorithm) for the programme. As she is using Twitter whilst watching the programme, her experience is synchronous. The fact that she uses a defined hashtag that has been created for use during the show makes her experience orchestrated. However, as the orchestrator (i.e. whomever came up with the hashtag) has no control over what the people of Twitter will say on the hashtag, Stephanie's experience is considered to be evolving. Equally, as they have no con-

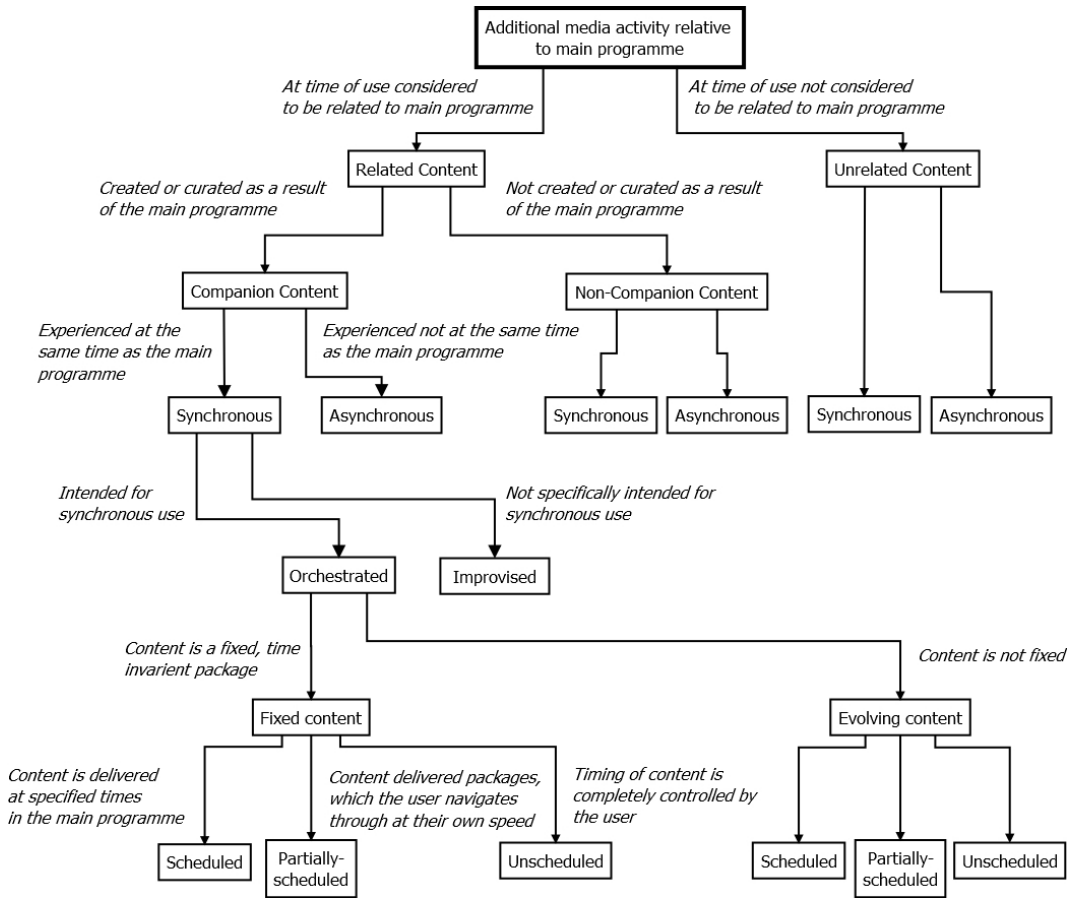


Figure 5.1: Graphical representation of the proposed taxonomy for additional media activity relative to a main programme

trol over the timeliness of the delivery of the tweets, her experience is considered to be unscheduled. Thus, Stephanie's experience is categorised as an orchestrated, synchronous companion experience that is evolving and unscheduled.

Liam's experience of exploring more about beluga whales on Wikipedia while watching a nature programme is categorised as a synchronous, non-companion experience—as the Wikipedia article was not created or curated for the programme.

Jess's experience of reading the blog of Dr John Watson, a fictional character from the drama 'Sherlock', before the premiere of the new series would be categorised as an asynchronous companion experience.

Shachi's experience of checking her emails whilst watching the news would be categorised as an unrelated synchronous activity.

Alice and David's experience of using smart wallpaper while watching *Autumnwatch* would be categorised as an orchestrated, synchronous companion experience. It would further be described as fixed and scheduled.

5.6 Conclusion

For researchers considering the supplementation of television programmes with additional media activities, the ill-defined and overloaded terminology that is currently in use can be problematic. This work has sought to introduce a taxonomy that can describe the full range of possible experiences, and is granular enough to differentiate those experiences from each other. The work has intentionally taken a device-agnostic perspective. A number of factors were identified that could be used to effectively delineate experiences from each other. These included their content's relatedness to the television programme, whether their content was created/curated as a result of the television programme, the time at which they are experienced, and their degree of orchestration.

A taxonomy has been introduced, using these factors, to differentiate additional media activities within a structured set of terms. It is hoped that this taxonomy will provide benefit to both researchers, in providing a clear language by which to refer to their work and that of others, and practitioners, in thinking about the design of new user experiences. Equally, it should be noted that though this taxonomy has been presented as a way of categorising the additional media activities that a user engages with relative to a particular television programme, it is also hoped the taxonomy could be useful for the categorisation of additional media activities relative to other forms of media—a radio programme, for example. Indeed, in a world of transmedia storytelling, it is hoped that any aspect of an experience could

be considered as the main focal point, depending on what is the main focal point for the user. As this field continues to develop, it is inevitable that new categories of additional media activity will emerge requiring further extensions to this taxonomy. It is hoped that this work will provide greater clarity in this field going forward and a strong foundation on which future categories of experience may be added.

Chapter 6

Companion Experiences: An Exploratory Study

6.1 Introduction

The study detailed in chapter 4 showed that an orchestrated, synchronous companion experience, that is both fixed and scheduled, is a more enjoyable user experience when delivered on a large display behind a television, like smart wallpaper. The findings from that study revealed that the smart wallpaper experience was much more captivating; participants would use words like 'relaxing' to describe it, and the NASA-TLX revealed that participants experienced a far lower cognitive load during it. However, certain other findings from that study implied that the cursory consideration of the companion experience itself was detrimental to both smart wallpaper and tablet scenarios, with the smart wallpaper experience simply *mitigating* some of the problems that arose from this cursory consideration. For example, the eye-tracking data revealed that the tablet experience induced consistent monitoring of the companion screen, which was disruptive to the participants' experience. This issue was likely mitigated in the smart wallpaper experience due to the companion screen always being in the field-of-view of the user, and therefore providing content change 'cues' in peripheral vision—but this mitigation does not deal with the underlying problem that the orchestration of the companion experience itself (i.e. the companion content and its scheduling) had been given only cursory consideration.

Few guidelines exist for the consideration of those who might want to orchestrate synchronous companion experiences. While the published works in this area do offer many valid design guidelines/implications (see section 6.2), they can be complicated and difficult to synthesise by those wishing to use them. This is due to the fact that many of those works that offer design guidelines have reached their conclusions

through the evaluation of very specific, fixed-upon applications—causing the design implications they offer to being equally specific and tightly bound up with the applications from which they were drawn. In other words, there is currently no *collective* comprehension on how to orchestrate synchronous companion experiences and few digestible guidelines exist for the consideration of those who might want to create them.

Consequently, this led to the consideration of whether it was possible to explore at a more basic and deliberate level how best to design synchronous companion experiences. Perhaps it is possible to learn what should comprise companion content, and how to schedule it, from users themselves. Perhaps craftspeople, such as television producers and directors, would know best when it is most appropriate to schedule companion content. Furthermore, perhaps they would know what content to add. The work presented in this chapter details two exploratory studies that were designed to explore these proposals in order to generate an innovative and useful hypotheses for study. This work was performed as a pre-cursor to further experimental work (see chapter 7).

The first study involved detailed interviews with a television producer. These interviews had several aims. Firstly, to get their thoughts on what they saw as the opportunities for companion screen experiences in general. Secondly, to go through a television programme created by them, and get their thoughts on when they would intervene with companion content, and what that content would be.

The second study involved detailed interviews with a number of television users. These interviews again sought the users' thoughts on what they saw as the opportunities for companion screen experiences in general, as well as gathering data about how they currently interact with a television programme, and how they would augment it with companion content. The programme in question being the one discussed with the television producer in the first study.

These studies were designed to uncover some of the possibilities for orchestrating companion screen experiences, in order to form useful hypotheses about such experiences for further scrutiny (see chapter 7). This work builds on the mounting body of work exploring companion screen experiences, but takes a novel approach by conducting exploratory work involving both users and craftspeople at the earliest opportunity. In this way, the work detailed in this chapter and in chapter 7 aim to provide at least one clear guideline/grounded advice for television professionals who wish to orchestrate second screen experiences—which would be a useful contribution to the field of TV user experience. This chapter presents the first part of this work—forming a hypothesis concerning a potential guideline for further scrutiny in subsequent experimental work (see chapter 7).

6.2 Related work

The existing literature around companion experiences has explored a variety of potential application areas, as detailed in chapter 2. However, relatively few of these explorations have involved the craftspeople who actually make the television programmes being augmented, or the users who watch them. One exception is the work of Nandakumar and Murray, who involved the writer of the television programme *Justified* in the design of their companion experience to that programme [Nandakumar & Murray, 2014]. That interview, though, is mentioned only briefly by the authors—and it was performed *after* they had decided upon the form of their companion experience, and the television programme it would accompany. As such, it is unclear what impact the involvement of the writer had on the development of the companion experience. Another exception is the work of Perez Romero, who employed a user-centred design approach to design a news companion [Perez Romero, 2013]. As the author states, however, this approach was possible 'due to the focused nature of the proposed research'—user-centred design works best when designing a user interface for a service that is already specified: the author had already decided upon the broad form of the companion experience to be designed. So, though the existing literature has explored a variety of application areas, few of these explorations have involved television professionals or television watchers in the design of the investigated applications, with the exception of those studies pointed out above. Furthermore, in the case of these studies, both had already decided upon the nature of the applications by the time they came to involve television professionals/users. It is conjectured that it would be useful to involve such people at an earlier stage: perhaps as part of deciding upon the nature of the application. This would allow for the holistic creation of more generalised guidelines that industry practitioners may easily apply—as drawing design implications from evaluating specific, fixed-upon applications can cause those design implications to be equally specific, as can be seen in other related work.

Many of the published works in this area have come up with useful design implications/guidelines. As stated above, however, they can be tightly bound with the applications from which they are drawn, and therefore not easily applicable by practitioners. For example, the work of Feltwell et al. examined two companion experiences that 'facilitate and promote more critical live-viewing of reality TV' [Feltwell et al., 2017]. One of the design considerations they suggested was that creators of companion experiences should 'design for friction'—which is highly tied to the motivations of the authors themselves, who wished to design for critical viewing. Equally, the work of Dowell et al. was focused on aiding viewers of 'information-rich' television programmes by providing graphical representations of a programme's content [Dowell et al., 2015], and one design implication they posited was that 'the representation provided by a companion app should be a synoptic reinforcement of the television programme's content'—though clearly 'the representation' is some-

thing that makes sense only in the context of providing a representation of content as a companion, which was the goal of the researchers in this case. This pattern can be seen in a number of other published works also [Anstead et al., 2014; Basapur et al., 2012, 2011; Nandakumar & Murray, 2014; Perez Romero, 2013]. In one interesting study, design implications were drawn from a live, deployed companion application with the help of both the producers of that application, and from its users. However, again, those implications were tightly bound to that application—and it is interesting to note that the producers in this case were the producers of the companion experience itself, and not the producers of the television programme it accompanied. Whilst this is of course useful and valid, it is conjectured that some insight could be gained from those who produce a programme directly and have a more encompassing view over a programme. In general, the published works in this area present many design implications, all of which are useful, and validly drawn in their own contexts. It is possible, though, that it could be difficult for a television professional to interpret these design guidelines in reality, as they are so tightly connected to their own contexts.

In summary, few of the evaluated companion experiences in the literature have been designed with consultation from the television professionals who make the programmes they accompany, or from the television users who watch them—it would be good to redress this. One reason it would be good to redress this is to generate holistic design guidelines that can be applied more easily by TV professionals. The design implications/guidelines that currently exist tend to be based around the particular company experience from which they were drawn—and so can be quite specific and hard to apply in other, different scenarios. It is hoped that gathering the views of television professionals and television users at the earliest opportunity could lead to more generalised design guidelines that can therefore be easily applied by practitioners in the future, and at least one guideline that can be applied and validated by the author of this thesis (see chapter 7 for more on this).

6.3 Phase 1: Producer interviews

6.3.1 Participant

This study involved one participant, a male television producer. The participant had four years experience producing arts and factual programmes for the BBC and other broadcasters, which was the only criteria required for this study—no other participant eligibility criteria were applied. Participant recruitment was done through personal contacts within the BBC. The participant did not receive any remuneration for taking part in the study. Ethical approval for the study was applied for and granted by the University of Bath department of Psychology (reference 15–118) and

written consent to participate was obtained from the participant.

6.3.2 Design

The study conducted in Phase 1 involved exploratory interviews with a television producer. These interviews were designed to gather insights from a television professional on the following:

1. What they saw as the opportunities for companion screen experiences in general.
2. How they would orchestrate a companion screen experience. Specifically:
   (a) At what moments they would intervene in a television programme they had worked on and provide extra content on another screen.
   (b) What extra content they would provide to accompany that television programme, both in general and specifically at the moments in time discussed as part of part (a) above.

To gather these insights, the following two interviews were designed.

The first interview was unstructured and conversational in nature. It was designed in this way in order to deal with point 1 above, whilst also preparing the participant for a 'deeper dive' into their thoughts in the second interview. In addition, it set the participant the task of choosing a television programme that they had worked on to serve as the stimulus for conversation in the second interview.

The second interview was also unstructured, whilst also taking inspiration from 'cued recall debrief' techniques. Cued recall debrief is a method, originally developed by Omodei et al., that requires a task under evaluation to be videotaped from a first-person point of view and replayed back to a participant immediately after completion of the task [Omodei & McLennan, 1994]. The method was developed as one that can elicit thoughts, affect, emotion, and cognitive experiences *throughout* an experience without interfering with a participant's behaviour in a naturalistic setting—that is, retaining ecological validity. As such, the cued recall technique could be considered well-suited to the field of HCI as a technique for evaluation the use of a system where participant affect may very throughout use—indeed, such suitability was described and explored by Bentley et al. in 2005 [Bentley et al., 2005]. Specifically, in this case, incorporating elements of cued recall debrief seemed particularly well-suited to the aim of the second interview. The aim of the interview was to deal with point 2 above—to allow the participant to freely analyse a television programme worked on by them in order to define moments when they would intervene and provide

extra content on another screen throughout a programme, and what content they would provide. Given the ability of the cued recall debrief methodology to allow participants to give feedback *throughout* an experience, rather than only at the end, and without the specificity of timing, the cued recall debrief technique was considered to be particularly appropriate. To achieve this, the researcher and the participant watched the television programme chosen by the participant together, with the participant free to pause the video at any time and freely reason about companion content. In this way, the television programme acted as a 'cue' for the participant to provide insights on point 2 above—in the style of a cued recall debrief methodology.

6.3.3 Materials

The first interview was conducted over video conference, with both the researcher and participant in private meeting rooms at the BBC (the researcher in Dock House, MediaCityUK, and the participant in Pacific Quay, Glasgow). The second interview was conducted in person, also in a private meeting room at the BBC—in Broadcasting House, London.

Prior to the first interview, the researcher was equipped with the following:

Internet-connected laptop A laptop with a working Internet connection was required in order to run the following software:

Video conferencing software The laptop was required to run some form of video conferencing software in order to video call the participant—Skype[1] was used in this instance.

Audio recording software The laptop also needed to run audio recording software in order to capture the interview—QuickTime[2] was used in this instance.

Paper-based equipment Appendix C contains all the paper materials used. The paper materials included:

Interview prompts The list of interview prompts to be used if needed.

Prior to the second interview, the researcher was equipped with the following:

[1] Skype is free video conferencing software that is widely used, see https://www.skype.com/en/.

[2] QuickTime is software for handling multimedia that ships with Mac OS X, see https://en.wikipedia.org/wiki/QuickTime/.

Laptop A laptop (no Internet connection needed) was required in order to run the following software:

Audio recording software The laptop needed to run audio recording software in order to capture the interview as above—QuickTime was again used.

Video playback software A means to play/pause/navigate the video file of the television programme chosen by the participant—QuickTime was used.

Television programme recording A video file of the television programme chosen by the participant to be used as the basis for the interview—in this case, the participant chose the programme *One Night in Manchester*, a BBC Four programme reviewing the Manchester International Festival.

Paper-based equipment Appendix C contains all the paper materials used. The paper materials included:

Interview prompts The list of interview prompts to be used if needed.

Both interviews were conducted in private BBC meeting rooms, where lighting and sound are kept at normal domestic levels.

6.3.4 Procedure

In advance of the first interview, the researcher had arranged a time with the participant to meet and had booked meeting rooms for both the participant and the researcher. The participant had been pre-advised that the first interview would take no longer than 30 minutes, and the second no longer than 1 hour.

The researcher video called the participant at the specified time to conduct the first interview. Consent had been previously obtained.

At the end of the first interview, the researcher set the participant the task of choosing a television programme that they had worked on in advance of the next session, for analysis during the next session. The researcher requested that the participant communicate their choice back to the researcher in advance of the next session, which the participant did via email.

The researcher met the participant to conduct the second interview at the specified time and place.

6.3.5 Results

This section presents the results of the interviews with the producer. Conducting these interviews with a television producer was a valuable opportunity and, as such, these results guide and inform much of how this thesis progresses from this point onwards. Given their importance, the full transcripts of the two interviews are presented in Appendix C for the perusal of the reader. The content of each interview was analysed, with key themes highlighted in the following sections along with illustrative quotes.

6.3.5.1 Interview 1

To summarise the first interview, the participant discussed how he believes multi-screen experiences in the living room are an 'inevitable direction of travel', and although he is on-board with this idea, he believes there is some resistance in certain parts of the industry:

> I'm quite interested in these new frontiers myself, there's, you know, there's some narrative resistance in certain areas of interest institutionally.

Indeed, the participant raised concerns that in his territory, factual arts and history, the target demographic skews older, with mid–60s being the average age—so they're more resistant to the idea of second screens and fragmenting attention spans:

> There's just a generation who are more resistant towards the idea of adopting more screens.

Moreover, the participant explained several ideas they had to interest younger audiences in factual arts and history, and one in particular that they dubbed 'Restoration Tinder' to attract younger audiences:

> I've been trying to think of a way to make some of the content around that moment in the 17th century interesting to an audience who are more familiar with that kind of, er, interaction.

The participant raised some general concerns around copyright and what this would mean for the additional media companion screen experiences:

> I don't think there's any copyright issues associated with the bare bones of that interface.

The participant discussed interactive documentaries that he had experience with, and mentioned that while he enjoyed them, he had some reservations—specifically, the prescriptive nature of the interaction and how it felt very forced and jarring to him:

> They found it very frustrating because they thought it was too overwhelming initially... And that instantly made them check out of it.

He specifically explained the need for interaction to be layered for different groups and demographics as not everyone will want to interact on the same level, and how he felt two streams of video was very difficult to focus on and not optimal:

> Some people will always want that all consuming comprehensive experience and just have access to absolutely everything and other people will want as little tertiary information as possible.

He raised the problem of having to download multiple bespoke apps for different channels and programmes etc., and how much space they take up on devices:

> It's the trade off between what people are willing to invest versus what you can offer them and I think actually we make too much of an assumption on what we think people should invest their time in.

Finally, the participant discussed the diminishing role of scheduling in television production, and how BBC iPlayer was the organisation's best opportunity for allowing programmes of different lengths and formats to be made:

> [The iPlayer commissioning editor] can commission content, which is great, which then doesn't strap us in to the tyranny of the, you know, the delivery times of 28 minutes or 59 minutes.

6.3.5.2 Between-interview task

The producer chose the BBC Four programme *One Night in Manchester* as the basis for the second interview [BBC, n.d.], which they communicated to the researcher via

email. This is an hour long factual arts programme reporting on the 2015 Manchester International Festival. The programme is magazine-style and composed of a number of sections:

- an opening with the presenters Kirsty Wark and Mark Radcliffe
- an interview with Moira Buffini and Damon Albarn about their musical *wonder.land*
- a performance by the Manchester Chamber Choir
- an interview with Maxine Peake about the play she starred in at the festival, *The Skriker*
- a performance by singer Josephine Oniyama
- an interview about the festival in general with outgoing festival director Alex Poots and Mancunian actress Julie Hesmondhalgh
- an interview with the creators of the ballet *Tree of Codes*
- a performance by a stand-up comedian
- an interview with Charlotte Rampling and Douglas Gordon about their play *Neck of the Woods*
- a performance by a Brooklyn dance group

6.3.5.3 Interview 2

In the second interview, the participant initially discussed the researcher's thoughts on companion content related to the location of the television programme—Manchester. He was unsure of how interested those who weren't from Manchester would be interested in such information, but thought there was a chance people would want to 'map out' the festival in their minds:

> As they're talking about some of the locations like you don't get a sense of, erm, geographically how things are spaced.

The participant discussed how he decided to use a 'wallpapering' technique during the wonder.land interview in order to show more content he thought the audience would be interested in. He discussed how it would be nice for the audience to be able to see more of the supplementary content on a companion screen, so they could choose to be able to look at this content themselves:

> It might be nice if there was actually a little bit more of the illustrations, and you could just, it's the kind of thing that people might want to know, 'Oh actually, I'm interested.'

The participant discussed that the usual audience of the programme would struggle with some of the 'younger' concepts being discussed in the wonder.land interview, such as avatars, and how including more information about these concepts in companion content would be beneficial to them. Interestingly, the participant also mentioned the possibility of drawing in a new and different audience to this kind of programme via a highly interactive companion experience—by potentially allowing the audience to create their own avatar:

> I mean this is quite a small programme, it's a one-off thing on BBC Four late on Sunday night, but you know obviously, if it was a much, much bigger piece in itself you could, er, allow the audience to, with a second screen, create their own avatar.

The participant communicated the reason why he chose this particular programme to be the basis of the second interview. Specifically, he thought that this programme suited the 'grasshopper brain'—short pieces of content that could be layered with interactive content over each separate segment:

> The fact that this is short form content makes it strong to me, because it is—it suits the grasshopper brain.

Similarly to the first interview, the participant again raised serious concerns over copyright issues, something that clearly currently impacts his day job of creating arts programming—and would no doubt impact any companion experience to that programming. He explained the use of 'fair dealing' at length, demonstrating his serious concerns around copyright:

> Fair dealing means you can use, erm, any performance extracts or any, erm, anything that's in copyright be it a literary text, be it a bit of music, a photo, a film, as long as it's for the purposes of critique and review.

The participant discussed a number of ideas for companion content to the interview about The Skriker. He mentioned either having a copy of the script available to peruse—or even having a 'Top Trumps' style breakdown of each of the Skriker's personas depending on the audience demographic:

> I would have loved to have in front of me, I mean, just the text of the play itself, because it's all about crosstalk and word play and so on. I think they talk in the interview about The Skriker having 5 or 6 different incarnations... And a sort of Top Trumps, you know of the characteristics of each.

When discussing the performance sections, the participant specifically talked about just having a small amount of information on a second screen about the performer, such as biographical information about the singer Josephine Oniyama. His reasoning for this was to ensure the companion content did not undermine the performances:

> All you'd want here is a small just kind of like biography, who is she, what's she done, where is she from, things like that.

The participant talked about simply having the entire performance of Tree of Codes playing alongside the interview segment for it, citing the visual nature of the production:

> Because it's the physicality isn't it, I know, that is a bit of a challenge but I think it's worth thinking about.

Finally, the participant discussed the value in giving viewers some alternative for what they were watching on the main TV screen—as each segment won't be for everyone:

> There are some people who are going to want to just watch the entire production, and some people who need to think around, as you say on the iPad.

6.3.6 Discussion

The aims of these interviews were to gather insights from a television professional on companion content, and on the potential orchestration of a companion screen experience to a particular television programme. The interviews gathered many useful insights on these things, particularly when it came to companion content, though perhaps less so on the moments when the participant would intervene in a television programme they had worked on and provide extra content on another screen. The participant paused the video occasionally when he had a point he wanted to discuss,

but, more often than not, he simply talked over the top of the video as and when ideas for second screen content occurred to him. In other words, the moments at which the participant paused were not necessarily indicative of moments when it would be appropriate to intervene and add extra content on a second screen. In fact, what turned out to be far more insightful were the ideas the participant had for companion content. The participant had many insights in this area, as can be seen in the summary of each interview. Of particular interest was the participant's suggestion of drawing in new and different audiences to arts and factual programming via highly interactive companion experiences, and their suggestion of aiding the current audience by providing more information on a companion screen. This was particularly interesting as very little work has been done to determine whether a companion experience could be used to deliver a more personalised experience to a user, see the 'Related work' section of chapter 7, section 7.2, for more on this.

6.4 Phase 2: User study

6.4.1 Participants

The participants in the study were 7 individuals (2 males, 5 females, aged 21, 25, 23, 35, 57, 62, 81) recruited from staff and students (undergraduate and postgraduate) at Manchester and Salford universities, from staff at the BBC, and from contacts of the researcher. Recruitment was through advertisement on mailing lists and noticeboards. All participants had normal or corrected to normal vision. No other participant eligibility criteria were applied, though all except one of the participants reported using a smartphone, laptop, or tablet whilst watching TV. Participants were given £10 remuneration for taking part in the study. Ethical approval for the study was applied for and granted by the University of Bath department of Psychology (reference 15–193) and written consent to participate was obtained from each participant.

6.4.2 Design

The study conducted in Phase 2 involved exploratory interviews with television users based on the television programme chosen by the participant in Phase 1. This study had similar aims to the interviews conducted in Phase 1, with a few subtle differences. Specifically, the study conducted in this phase was designed to gather insights from audience members on the following:

1. What they saw as the opportunities for companion screen experiences in gen-

eral.

2. What they wanted from an orchestrated companion screen experience to *One Night in Manchester*, programme chosen by the participant in Phase 1. Specifically:

   (a) At what moments in the television programme they would want extra content on another screen.

   (b) What extra content they would want to accompany that television programme, both in general and specifically at the moments in time discussed as part of part (a) above.

3. How their attention to the television programme fluctuated throughout watching it, to see if it was possible to infer potential appropriate moments to intervene and provide extra content on a second screen.

To gather these insights, the study presented in this section was designed.

Firstly, each participant watched the programme in a living room setting. Due to the length of the full programme (one hour), it was decided that only the first half of the programme would be used, encompassing the first six segments.

After each participant had watched the programme, the participants were then asked to perform a pen and paper recall task. This was to address point 3 above—to assess how participants' attention to the television programme fluctuated throughout their watching of it. Recall was chosen over visual attention for a number of reasons. The main reason being that many researchers have built a convincing body of evidence that exposure does not determine attention [Biocca, 1988]. Rather, exposure seems to be a necessary but not sufficient case for attention to occur. As such, recall can be seen as a better measure than visual attention which effectively measures exposure—as recall shows that if a participant remembers something, then they selected it for processing and were therefore paying attention to it. The secondary reason for choosing recall over visual attention was that it was minimally invasive to the watching process, which allowed for a higher level of ecological validity.

Following the recall exercise, an interview was then conducted that was similar in nature to the one conducted with the producer in Phase 1. That is, the researcher and the participant re-watched the television programme together, with the participant free to pause the video at any time and freely reason about companion content.

6.4.3 Materials

Each study session was conducted in a room that had a 'living room' feel, to replicate the usual environment in which participants would watch television and to provide a higher level of ecological validity than was achieved in chapter 4. The researcher was present at all times.

Prior to each session, the room was equipped with the following:

Laptop A laptop (no Internet connection needed), which was used to run necessary software and power other equipment. Specifically, the laptop needed the following resources/to act in the following ways:

- **Video playback software** A means to play/pause/navigate the video file of the television programme chosen by the participant in Phase 1—QuickTime was used.
- **Act as a television** The laptop needed to run the video playback software in order to act as a television that would be displayed on a television in the study space.
- **A copy of *One Night in Manchester*** A video file of the television programme chosen by the participant in Phase 1, *One Night in Manchester*, a BBC Four programme reviewing the Manchester International Festival.

Television A television was required in order to show the television programme. This television was powered by the laptop.

Video recording equipment The study space was equipped with video recording equipment, which was used to capture each study session.

Paper-based equipment Paper materials and a supply of pens/pencils. Appendix C contains all the paper materials used. The paper materials included:

- **Consent form** The consent form, information sheet, and demographics form.
- **Recall questionnaire** The open recall questionnaire.
- **Interview prompts** The list of interview prompts to be used if needed.

The lighting and sound in the room were kept at normal domestic levels at all times.

6.4.4 Procedure

Each participant was met by the researcher, and brought into the study space. They were then invited to sit directly in front of television, where the programme

would be played. At this stage, the participant was invited to read an information sheet explaining what the study would entail. Following this, written consent and demographic details were obtained.

The researcher then started the television programme. When the programme had finished, the participant completed the pen and paper recall exercise about the content of the programme. Following this, the interview was conducted.

Finally, participants were fully debriefed about the nature of the study and given the contact details of the researcher to take away. The total duration of each session was approximately 60 minutes.

6.4.5 Results

The data from the recall exercise were not patterned in any way, and so did not reveal any insights. The results were coded for number of correct facts recalled to see if there was any correlation between participants demonstrating moments of highest recall—thus revealing which moments would be inappropriate to intervene—but there were no such correlations. The results from the seven user interviews were very revealing, however. An inductive thematic analysis was performed on the user interviews. This analysis followed the steps for inductive thematic analysis laid out by Braun and Clarke [Braun & Clarke, 2006]. This analysis was considered to be well-suited to the aims of this chapter, which were to gather the insights of members of the public in order to deliberately form a hypothesis, grounded in relevance, for investigation by the researcher. As such, the interviews were used to gather these insights, and the inductive thematic analysis was used as a way to provide a rich description of the data gathered in those interviews, by following the step-by-step process outlined in the Braun and Clarke paper. Specifically, the step-by-step process followed included: familiarisation with data and code generation, sorting codes into themes, defining and naming themes, and producing a report. As mentioned in the Braun and Clarke paper, these steps were recursive, and did not necessarily have distinct boundaries—they often overlapped each other. The resulting report is presented in the remainder of this section, and is structured around the themes and sub-themes generated. Those themes were: **content**, with sub-themes *segment subject matter*, *segment type*, and *segment length*, **experience design**, with sub-themes *holistic*, and *device-controlled*, and **producer correlation**.

6.4.5.1 Content

Unsurprisingly, given the nature of the interview, one of the most apparent patterns in the responses from participants was around ideas for companion content to the

television programme, and the format companion content might take. This theme has been named *content*. Participants had many and varied views on potential companion content. For example, when discussing the segment about *wonder.land*, one participant suggested getting more 'behind-the-scenes' information on a second screen:

> Depending on who you are, I mean, the costumes in this are amazing. You know, it would be great to see insight into that, you know like the rehearsal process.

Furthermore, when discussing *The Skriker* interview with Maxine Peake, another participant suggested having material referenced in the interview available on a second screen for their perusal:

> When they said about the book, for example, like Naomi Klein's book, that, like, that could have been something that you could, like, open in a Kindle sort of way. It's kind of like referencing in an essay because you can, like, look them up and read the words, sort of.

And when discussing performances, but also companion content in general, one participant had the following to say:

> Like how to get tickets, how to dress like this, how to do the make-up, how to sing like this, the words, how to get the album and so on. I would guess with bands and groups and things like this normally, but it'd be good to get backstage information, little tidbits that you wouldn't normally get, you know, out there.

Several more specific sub-themes around companion content and format were also apparent in the data. As mentioned previously, the television programme used as a stimulus for the interviews discussed here was comprised of a number of different segments. Participants had different ideas about companion screen content depending on which segment of the programme they were discussing. That is, they had different ideas for content on a per-segment basis—with these ideas seemingly revolving around the nature of the particular segment they were concerned with. The particular elements of the segments that seemed to have the most impact on participant views about companion content were: its particular subject matter, its type, and its length. These different elements of the segments, which were most prevalent in the patterned responses of views on companion content, are detailed as sub-themes in the following sections.

Segment subject matter

Participant ideas for companion content and the format it should take would vary depending on the subject matter of a particular segment. For example, participants had ideas that were specific in form to the segment about the musical *wonder.land*, and ideas that were totally different in form for the segment about the play *The Skriker*—as is demonstrated in the quotes of the previous section. Furthermore, when discussing the *wonder.land* segment, one participant suggested the possibility of interacting with the avatars that feature in the musical:

> Well actually I've come up with, maybe, for the first segment, the one about the *wonder.land*, maybe you could have, I don't know, something kind of interactive. You know, to go behind the scenes with how they, kind of, made, well, not how they made them but, you can actually interact with the, like, cat-thing that comes on screen. [...] And then maybe you could, kind of, kind of have like two avatars, kind of Alice and kind of the avatar that you've created. And also you could have the cat-thing to, like, take you through.

And when discussing *The Skriker*, one participant wanted to see the manuscript of the play and learn more about its dialogue, which was heavily discussed in the interview:

> It would be good to see the, kind of, manuscript that you, kind of, saw there, kind of would, kind of, you know, could go through that and could kind of, could yeah, could you know, kind of, see what [Maxine Peake] has to learn when she does her lines.

In other words, participant responses regarding companion content and its format were not necessarily general: they often were very closely tied to the subject matter of the particular segment of the television programme. This perhaps demonstrates that magazine-style programmes like *One Night in Manchester* stand to benefit from delivering companion experiences whose content and format has been considered on a segment-by-segment basis—and also that a 'one-size-fits-all' solution to the format of the companion content is not necessarily beneficial for a magazine-style television programme. Additionally, it perhaps demonstrates the importance of subject matter to the format of companion content more generally, not only in the case of magazine-style television programmes.

Segment type

Participant ideas for companion content and format would vary to an extent depending on what is referred to here as the *segment type*. The segments of the programme

could be broadly categorised as either interviews or performances—and the category of segment had a distinct impact on the responses of participants to queries about companion content. In particular, when discussing performances:

> I think also in terms of connecting with the artists—the girl who played the guitar, the Liberian singer, I wanted to find out more about her music, that would be interesting. That sort of thing where you could get closer to the actual artist.

Furthermore:

> Well I guess if it's a documentary or something then I'd use my phone on like the bit where the girl was singing—I missed her name.

Equally, participants expressed views on whether a particular type of segment was or wasn't suited to being accompanied by additional media as part of a companion experience. Performance segments, for example, were considered to not necessarily be suitable:

> When you're watching a performance, it's kind of—I think it'd be a bit distracting to have... I mean it is when people are talking too but sometimes it's good to have, like, background information. Whereas when it's someone singing something... unless it's, like, just telling you who they are.
>
> For [the performances], if someone wanted to find out more then this is something they could, you know like, remember and they could do that themselves after. But I don't necessarily think that they would want to be prompted while they were watching it, you get drawn in.

It is important to note that, specifically, participant views on companion content were broadly similar for performance segments, but varied in form for the interview segments, as can be seen in the explanation of the previous sub-theme. In other words, this sub-theme is an interesting counterpoint to the previous theme (where it was suggested that companion content and its format should be considered on a case-by-case basis due to the strong influence of subject matter on participant views), in that this sub-theme suggests that it is possible to apply generalised rules to companion content—*though only when the main screen content conforms to a specific, well-known type* like a live performance, as can be seen in this instance.

Segment length

Participant thoughts would vary depending on how long the segment was—for longer segments their thoughts would be much more involved. For example, while discussing a segment of length 7 minutes 41 seconds, one participant suggested:

> This is done in a way which, kind of like, gives you the whole perspective and really wants you to go into the performance, see what the Striker [sic] is, and maybe the screen could, kind of like, give you information about what are the seven roles that the Striker [sic] takes on, what is the purpose. Because there was a lot of conversation, a lot about the complexity of the dialogues, which is absolutely wonderfully performed, but then you want to know, 'how did they do this?' and stuff like that.

Whereas, when discussing segments of shorter length such as the performances segments, ideas were far less involved, often involving only receiving biographical information about the performer on the second screen, as can be seen in the explanation of the sub-theme *segment type*.

This could be related to the *segment type*, as the interview segments were both longer and more complex than the performance segments. In the same way it could also be related to *segment subject matte*r, as the content of some segments allows for more creative ideas.

6.4.5.2 Experience design

Participants had very direct thoughts about using two screens, a personal device and a TV, to deliver this programme, beyond just ideas for companion screen content—whether that meant the two screens working together to provide a holistic experience, or the personal device being used as a control.

Holistic

Participants wanted different screens to act as different channels providing a single, unified experience—as opposed to providing parallel companion content on a tablet screen. Specifically, participants wanted the screens to work together to deliver a single experience. For example, one participant suggested seeing the cuts to clips during interviews on a secondary screen:

> They do have things on this where they briefly, like, flash something. Like they did do a bit with, was it the game that they went to? But that kind of detracts from this, I thought because there was quite a lot of them and I noticed that, really, before I knew what this was about, if

> you know what I mean—I thought that kind of detracted from it. But if you had it on another device then it would be... it wouldn't be as distracting from the main narrative.

Another participant suggested wanting the companion screen to deliver complementary streams of humour and commentary—whilst stating that they currently use social media on a secondary screen to get this kind of experience:

> I think, you know, obviously social media has a huge role to play in this. And this isn't the sort of show, currently, where you would sit and... you know, like, I, I put on my form that... certain programmes I'll watch the Twitter hashtag when that programme is on, which is part of the entertainment factor these days for certain programmes because of, you know, the amount of humour and commentary that goes on.

In fact, participants had some reservations about companion screen content because they thought it *couldn't* deliver a single experience:

> See what you've got a problem with is you've got the programme's playing and then you're interacting. You can only have a certain amount of interaction because if you have too much you'll lose it—you'll be going, 'well I want to play Skyrim now, but I want to be watching this and I don't know which to do.' And you can be overfaced and think 'well I'm just not going to bother with the interaction.'
>
> I tend to use, if I'm watching something factual and I haven't understood something or I'm interested in it, I may look at my phone or look at my tablet just to look stuff up as I'm watching it. Or I might make a mental note and then afterwards look at the tablet or the phone to do that. But if it's intriguing, as, I think, I'm intrigued by Maxine Peake—as I say, she could read the telephone directory and I'd be interested—so I probably wouldn't use my phone or tablet while she was speaking.

Device-controlled

Participants wanted the segments to be made available as separate short videos which could be browsed and viewed on personal device, like a smartphone or tablet, without a television:

> I'm thinking of like a 'Guardian Online'-type scenario where you can chunk in to different segments and you can tap in to different segments.

> Or like the BBC website, for example, and given this isn't live you could do that. So you could run, kind of, different segments at the same time and enable me to tap in to it.

In a similar vein, participants wanted to be able to curate their own programmes—there was a desire from participants for they themselves to perform selection of segments from their personal device, to be played back on the TV. For example, one participant wanted to pick the segments using their personal device explicitly whilst watching the programme:

> I would have liked to hear more from the character herself rather than just the writers of the play. So that could be something you could have like a channel on [your personal device], you know like a... not YouTube channel, but you know, like a video of an interview with them instead, so whilst you might not necessarily get everything you want into the TV programme, you could've had extra footage to choose from. And that gives us a bit more, like, flexibility as to what we want to watch. A bit more choice, rather than just composing, like, the one interview from the, like, the writers or whatever they were.

Participant thoughts on using a secondary screen as a control device are perhaps because it makes more sense to them as an interactive device and not as a passive consumption device, or perhaps because it matches the current pattern of interaction they are used to with remote controls.

6.4.5.3 Producer correlation

The intuitions of the producer with regards to the wants/needs of different demographics were reflected in the thoughts/ideas of participants in those demographics.

The producer predicted that members of younger demographics would want a highly interactive or game-like companion screen experience. He saw an opportunity for opening up this type of programme, usually aimed at the 55+ demographic, to younger audiences—who wouldn't usually be interested in this type of programme—by using companion content. Indeed, this is reflected in the quote above where one participant from this demographic talked about interacting with the avatars from *wonder.land*, and again above where another participant from this demographic talked about interacting with the dialogue from *The Skriker*. It is equally reflected in the following, where participants in this demographic made the following remarks about their usual lack of interest in this kind of programme:

> And sometimes—I mean they were interesting, but, like, people aren't interesting when they get interviewed so you find yourself getting distracted.
>
> Actually watching it, it's something you could relate to as a young person, but I wouldn't initially choose to watch, was it channel... was it BBC Four did you say? Initially, like that's a channel I'd usually skip past, if you see what I mean. But if it was available on a mobile device in a more... way that you'd more easily come across it, if you see what I mean, then that might make more people watch it.

Moreover, the producer predicted that members of older demographics—the target audience for this programme—would be most interested in extra 'behind-the-scenes' information about the different elements of the festival being presented, as demonstrated in the following quotes from participants in that demographic:

> The thing is, the way they're describing it and the way they've extended it, you know—I would be really, really interested in knowing how it works, maybe where is it being presented again.
>
> Because I couldn't go on my iPad I had to actually had to write down 'Skyrim' because I thought—I'm gonna have a go at this, it looks such fun.
>
> I mean, even if I don't have an interest in choirs but if I was enjoying it, it would be nice to know what the piece was.

6.4.6 Discussion

The aims of these interviews were to gather insights from audience members on the potential orchestration of a companion screen experience to *One Night in Manchester*. Similarly to the interviews conducted in Phase 1, the study gathered many useful insights on these things, particularly when it came to companion content, but less so when it can to discerning appropriate moments to intervene in the television programme and provide extra content on another screen. Again, participants would pause the video as and when points occurred to them but more often than not simply talked over the top of the video as and when ideas for second screen content occurred to them. However, the insights the participants had about potential companion content were interesting—particularly the way the ideas of participants from particular demographic groups correlated with the producer's suggestions for those different demographic groups.

6.5 Conclusion

The studies presented in this chapter were designed to uncover some of the possibilities for orchestrating companion screen experiences, in order to form useful hypotheses about such experiences for further scrutiny. These studies unveiled several interesting insights. In Phase 1, the producer's suggestion of drawing in new and different audiences to arts and factual programming via highly interactive companion experiences, and of aiding the current audience by providing more information on a companion screen, was particularly interesting to the researcher as very little work has been done to determine whether a companion experience could be used to deliver a more personalised experience to a user. This was furthered by the insights unveiled in Phase 2, where the insights of the participants from particular demographic groups about potential companion content were correlated with the producer's suggestions for those demographic groups. Given these findings, it was hypothesised that *a companion experience to a television programme can be tailored to a particular demographic to provide that demographic with a better overall user experience*, fulfilling the aims of this chapter. A follow-up experimental study investigating this hypothesis is presented in the next chapter, chapter 7.

Chapter 7

Companion Experiences: Demographics and Personalisation

7.1 Introduction

> One Night in Manchester *is about to begin on BBC Four, so David fetches his tablet and navigates to the BBC Four companion app. When the programme starts, he knows it'll show him all the extra information he might want at a glance—which he appreciates. Jenny, David's teenage daughter, is in the living room too. She wouldn't usually watch this kind of thing, but, as it's on, she decides to pull out her tablet too. She downloads the BBC Four app to see what it's like. It's different to what David gets—throughout the programme, there are interactive items for her to get involved with. She's pleasantly surprised by the whole experience...*

The work presented in chapter 6 aimed to uncover some of the possibilities for orchestrating companion screen experiences, in order to form a useful hypothesis about such experiences for further scrutiny. This was done because it appeared that few digestible guidelines existed for the consideration of those who might want to orchestrate synchronous companion experiences, as explained in section 6.2, and it was thought that engaging with both producers and users of television could fill this gap.

And indeed, the findings from chapter 6 led to the hypothesis that *a companion experience to a television programme can be tailored to a particular demographic to*

provide that demographic with a better overall user experience. This hypothesis, if proven, could lead to a scenario like the one involving David and Jenny described above. This chapter details the investigation of this hypothesis, by evaluating the user experience of two companion experiences, tailored to two separate demographics, with participants from both demographic groups.

7.2 Related work

The existing literature around companion experiences has explored a variety of potential application areas, as detailed in chapter 2, many of which evaluated the user experience of those experiences. More specifically though, there has been relatively little work evaluating companion experiences where there has been pre-engagement with audience members or television producers, as is the case in this chapter. One exception is the work of Nandakumar and Murray, who involved the writer of the television programme *Justified* in the design of their companion experience to that programme [Nandakumar & Murray, 2014]. That interview, though, is mentioned only briefly by the authors—and it was performed *after* they had decided upon the form of their companion experience, and the television programme it would accompany. The related work in the previous chapter, chapter 6, provides more on the related work of this type. Equally, many of the published works in this area have come up with useful design implications/guidelines—but none of those works attempt to *validate* design guidelines previously drawn out as this chapter will do. Again, see the related work in the previous chapter, chapter 6, for mote detail on the related work of this type.

The potential for companion screens to provide users with more tailored and personalised experiences has been noted in a few places, though not rigorously evaluated. For example, Parnall and Murray discussed using second screens to deliver personalised television experiences in their technical IBC paper [K. Murray & Parnall, 2013]. Specifically, they discussed the need to understand what support is required in the underlying broadcast infrastructure to deliver such personalised services—though they did not provide any evidence to suggest that using companion devices to provide a tailored or personalised experience adds value to the overall television experience, as is done in this chapter.

In another example, there has been much work exploring companion screen experiences that are built on the users social media. This kind of experience is implicitly personalised, as each user's social media usage—who they follow, what they post—is personal to them. For example, Basapur et al. found that a companion screen experience that encouraged and relied upon the sharing of related content about a show amongst an already-existing small group of friends allowed users to better connect with their TV shows and have an enriched social life around TV content [Basapur et

al., 2012]. And equally, Schirra et al. found that 'live-tweeting' helped users build and maintain a network of viewers with shared interests, fulfilling their desire to feel connected to a larger community that is interested in the show [Schirra et al., 2014]. However, whilst such studies have found there to be a huge benefit to companion screen experiences that incorporate a social element, which makes these experiences implicitly personalised, none have explicitly analysed the impact of this implicit personalisation, and none have thought about other ways in which the companion experience could be personalised.

In other words, whilst there has been a recognition of the potential of second screens to provide a personalised television experience, there has not been any work done to explicitly validate that providing such experiences would add value to the overall television experience for users.

7.3 Hypothesis

As described above, this chapter explores the possibility of tailoring a companion experience to a particular demographic, in order to provide that demographic with a better overall user experience. Specifically, this chapter aims to discern how tailoring a companion experience to a demographic impacts the user experience of that demographic—given that the companion experience has been tailored based on the insights of both television professionals and audience members. Explicitly stated, it was hypothesised that:

H Tailoring a companion experience to a demographic, by using the insights of both television professionals and audience members, improves the overall user experience of that demographic.

The study reported in the remainder of this chapter is an experiment designed and conducted to test this hypothesis.

7.4 Participants

The participants in the study were 24 individuals (12 from the 18–25 demographic, 12 from the 55+ demographic, with an even split of gender) recruited from a mixture of staff and students (undergraduate and postgraduate) at Manchester and Salford universities, staff at the BBC, contacts of the researcher, and via a recruitment agency (due to the demographic requirements of this study). Recruitment was through either the recruitment agency, or via mailing lists and noticeboards.

All participants had normal or corrected to normal vision, and fell into one of the demographics needed for the study (i.e. they were aged either 18–25 or 55+). No other participant eligibility criteria were applied. Participants were given a £40 Love2Shop voucher as remuneration for taking part in the study. Ethical approval for the study was applied for and granted by the University of Bath department of Psychology (reference 16–111) and written consent to participate was obtained from each participant.

7.5 Design

The study itself was empirical in nature and followed a 2x2 between-participants experimental design, which was conducted with the researcher present at all times.

Within the experiment, each participant was shown the half-hour version of the television programme *One Night in Manchester* [BBC, n.d.] used in chapter 6 Phase 2, along with a companion experience on a second screen. The companion experience was either an experience tailored to the 18–25 demographic or one tailored to the 55+ demographic. These two experiences were tailored based on the insights of the television producer and television users presented in chapter 6. The 'Stimulus' section below, section 7.6, describes these two experiences in more detail. Thus, the first independent variable was *companion experience tailoring* with two levels: 18–25 or 55+.

In addition, each participant was either from the 18–25 demographic group (i.e. aged 18–25) or from the 55+ demographic group (i.e. aged 55+). In other words, the second independent variable (or predictor variable, in this case) was *audience member demographic* with two levels: 18–25 or 55+.

The conditions of the study were formed from these two independent variables, completing the 2x2 design. The design is depicted in Table 7.1. Explicitly, half of the participants from each demographic group were assigned to experience the companion tailored to their own demographic, with the other half experiencing the companion tailored to the opposite demographic.

After each participant had experienced their assigned condition, a measure of 'hedonic quality' was taken [Hassenzahl et al., 2001], to give an indication of how much participants enjoyed their experience. This is a self-report measure comprising seven pairs of adjectives that characterise the presence or absence of hedonic quality, evaluated on a seven-point rating scale. The adjective pairs used, which represent the extreme of each seven-point scale, are outstanding/second-rate, exclusive/standard, impressive/nondescript, unique/ordinary, innovative/conservative, exciting/dull and interesting/boring (Figure 7.1). Once participants rate the software on each charac-

	Companion experience tailoring	
	18-25	*55+*
Audience member demographic		
18-25	Participants aged between 18-25 who experienced the companion tailored to the 18-25 demographic	Participants aged between 18-25 who experienced the companion tailored to the 55+ demographic
55+	Participants aged 55+ who experienced the companion tailored to the 18-25 demographic	Participants aged 55+ who experienced the companion tailored to the 55+ demographic

Table 7.1: The study design. Participants in each 'cell' of this table had a unique combination of independent variable levels.

teristic, a hedonic quality 'value' is calculated by summing or averaging the ratings. This measure was chosen because the main goal in this study was to investigate experiential value, to examine whether tailoring companion content to a participant's demographic means they have a better experience, that they enjoy it more, or feel a greater sense of satisfaction. And whilst there are many self-report measures that could be employed to examine this, this one was chosen because it was specifically designed to assess the 'joy of use' of software systems from a task-unrelated perspective—looking purely at the experiential value of a user interface. This made sense from the perspective of evaluating a leisure activity, television watching, the focus of this thesis.

Additionally, after each participant experienced their assigned condition and the measure of hedonic quality had been taken, there was a semi-structured interview between the participant and the researcher. This was conducted to draw out the richness of participants' personal experiences, and was chosen partly because speaking to participants about their thoughts had proven to be highly insightful in chapter 6 Phase 2, section 6.4. This kind of qualitative approach was necessitated by the fact that this study was concerned with evaluating *how much a leisure activity had been enjoyed*, and it was considered that employing quantitative measures only would not provide the kind of richness of insight needed to test a hypothesis concerned with such. The interview schedule employed can be seen in Figure 7.2, and was designed to draw out the insights of participants with respect to the hypothesis **H**.

Thus the effect of the independent variables on the dependent variable of *user experience* was determined mainly through semi-structured interviews, and also through a measure of hedonic quality.

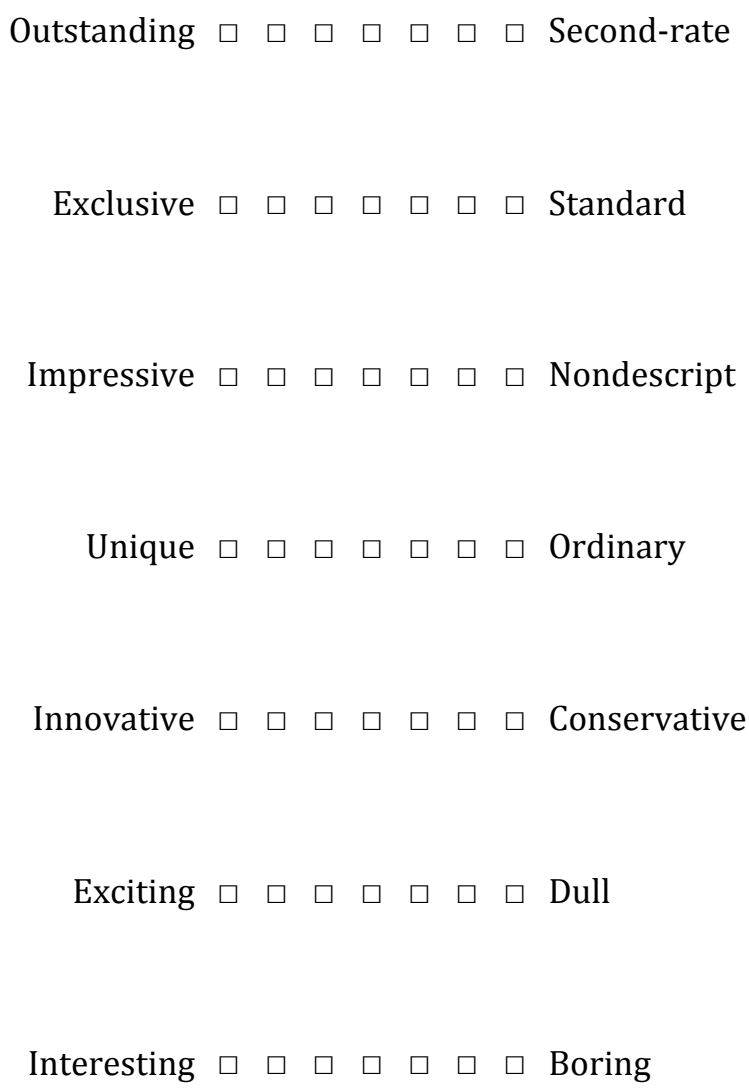


Figure 7.1: The hedonic quality self-report measure used in the study.

Interview Schedule

First impressions

What are your initial impressions of the experience? What were your first impressions/expectations when I first told you about what you would be doing today? Did the experience meet those expectations? Did it disappoint? Why? Can you envisage this being something you would use on a regular basis? Why?

Demographics, attention, value and disruption - implicit

What two things do you remember most about the experience? How would you rate those things? Were they good/bad/neutral?
How could the experience be improved?

Demographics, attention, value and disruption - explicit

Do you like this kind of TV programme usually? Did the companion enhance the programme for you? Did it detract from the programme?
How did you find watching a TV programme in this way? How did you use the companion? Do you think you spent a lot of time looking at it?
How did you feel about looking at it? Did you feel any pressure to look at one screen or the other? Did the two screens fit naturally with what you expected from them?
Was there too much to take in? Was it a welcome distraction? Were you not at all interested in it compared to the TV programme? Did it complement the TV programme well? Were you not at all interested in either? Was it just something to fiddle with? Would you use this at home?
Could you take or leave the second screen? Do you feel it added anything to your experience? Or took away from it? Tell me more about this.

General

Anything else you'd like to add?

Figure 7.2: The interview schedule used in the study.

7.6 Stimulus

The stimuli used in this experiment were two companion experiences. One was tailored to the 18–25 demographic, and one was tailored to the 55+ demographic. These two experiences were tailored based on the insights of the television producer and television users presented in chapter 6. Both experiences were designed to accompany the half-hour version of the television programme *One Night in Manchester* used in chapter 6 Phase 2—i.e. the first six segments of that programme. Specifically, the first six segments comprised:

- an opening with the presenters Kirsty Wark and Mark Radcliffe
- an interview with Moira Buffini and Damon Albarn about their musical *wonder.land*
- a performance by the Manchester Chamber Choir
- an interview with Maxine Peake about the play she starred in at the festival, *The Skriker*
- a performance by singer Josephine Oniyama
- an interview about the festival in general with outgoing festival director Alex Poots and Mancunian actress Julie Hesmondhalgh

The companion experience tailored to the 55+ demographic provided extra information to the user about the television programme content. This extra information was in the form of text and images that the user was able to browse on the companion screen at their leisure. Depending on the segment, different extra information was made available. Explicitly, each segment showed the following extra information:

- a splash screen during the opening with the presenters matching the title screen of the television programme
- a selection of rehearsal photos, 'behind-the-scenes' photos, and costume design drawings from the *wonder.land* production were shown during the interview regarding the musical, along with explanatory text
- two photos of the Manchester Chamber Choir during their performance, along with a few facts about them
- a selection of rehearsal photos, 'behind-the-scenes' photos, and costume photos from *The Skriker* production were shown during the interview regarding the production, along with explanatory text

- two photos of Josephine Oniyama during her performance, along with a few facts about her
- a splash screen during the closing interview matching the title screen of the television programme

Figure 7.3 demonstrates how this looked on the companion screen. This companion experience followed the insights of the television producer and television users presented in chapter 6, which suggested that the 55+ demographic would prefer a companion experience that provided extra information.

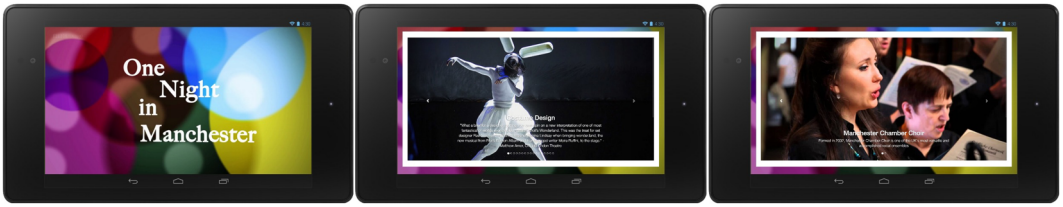


Figure 7.3: The companion experience tailored to the 55+ demographic. Screenshots from the opening, *wonder.land*, and Manchester Chamber Choir segments are shown.

The companion experience tailored to the 18–25 demographic provided a more interactive experience to the user. Each interview segment was accompanied by an interactive experience based around the television programme content. Each music performance segment was accompanied by biographical information about the performer. Explicitly, during each segment the companion experience provided the following:

- a splash screen during the opening with the presenters matching the title screen of the television programme
- an interactive experience where users were able to interact with graphical environments that replicated the look and feel of the virtual world of the avatars of *wonder.land*
- two photos of the Manchester Chamber Choir during their performance, along with a few facts about them
- an interactive experience where users were able to interact with a monologue from *The Skriker*
- two photos of Josephine Oniyama during her performance, along with a few facts about her
- a splash screen during the closing interview matching the title screen of the television programme

Figure 7.4 demonstrates how this experience looked on the companion screen. This companion experience followed the insights of the television producer and television users presented in chapter 6, which suggested that the 18–25 demographic would prefer a companion experience that this demographic would prefer a companion experience that provided a more interactive experience, except when it came to music performances—where extra biographical information about the performer was unanimously preferred by both demographics.

Figure 7.4: The companion experience tailored to the 18–25 demographic. Screenshots from the *wonder.land*, *Skriker*, and Josephine Oniyama segments are shown.

Technically, the companion experience was implemented using HTML5/JavaScript which ran in a web browser on the companion screen while the television programme was playing. The television programme also ran in a web browser which was shown on a television screen. As the television programme played, it sent broadcast events over the local network via a socket connection which were then received by the companion experience—which could then update its content accordingly. This system (the use of web browsers to display media combined with the use of socket connections to allow those web browsers to communicate) architecturally matched the smart wallpaper system described and used in chapter 3 and chapter 4—see those chapters for more about this approach.

7.7 Materials

Each study session was conducted in a room that had a 'living room' feel, to replicate the usual environment in which participants would watch television and to provide a higher level of ecological validity than was achieved in chapter 4. Prior to each session with a participant, the experimental space was set up with the following materials:

Network-connected laptop A laptop, which was used to run the companion experience system and to host the *One Night in Manchester*-specific content. Specifically, the laptop needed the following resources/to act in the following ways:

Companion experience system source code The laptop required a copy of the companion experience system source code to run the companion experience system. This system allowed the companion experience and the television programme to communicate with each other to ensure the companion experience could synchronise with the television programme. It also served the HTML5/JavaScript pages that the television and the companion screen needed to load in a web browser in order to play the television programme and run the companion experience respectively.

Act as a wireless router The laptop needed to act as a wireless router in order to run a small, controllable local network for the companion experience system to run on.

***One Night in Manchester* content** The laptop required a copy of the *One Night in Manchester* content for the companion experience system to serve, in order for the television to show the television programme, and for the tablet to run *One Night in Manchester* companion experience.

Act as a television The laptop needed to run a web browser used to play the television programme. This browser was displayed on a television connected to the laptop.

Television A television used to display the television programme, powered by the laptop.

Tablet device A tablet device used to run the companion experience in a web browser.

Video recording equipment Video recording equipment, which was used to capture each study session for the purpose of capturing the semi-structured interview.

Paper-based equipment Paper materials and a supply of pens/pencils. Appendix D contains all the paper materials used. The paper materials included:

Consent form The consent form, information sheet, and demographics form.

Hedonic quality The hedonic quality questionnaire (Hassenzahl et al., 2001).

Interview schedule The interview schedule.

As well as being set up with this equipment prior to each session, the experimental space had normal domestic lighting levels, and was kept quiet at all times.

7.8 Procedure

Each participant was met by the researcher in the experimental space, and invited to sit a sofa directly in front of the television where the television programme would

play. At this stage, the participant was invited to read an information sheet explaining what the experiment would entail. Following this, written consent and demographic details were obtained from the participant.

The participant was then set up with the tablet which was running either the experience tailored to the 18–25 demographic, or the experience tailored to the 50+ demographic, depending on which condition the participant had been assigned to. When the participant confirmed they were comfortable to continue, the researcher then started the television clip. At the termination of the clip, the participant subjectively rated their hedonic quality using the pen-and-paper questionnaire. Additionally, following the pen-and-paper exercise, the researcher conducted a semi-structured interview with the participant.

Finally, participants were fully debriefed about the nature of the experiment and given the contact details of the researcher to take away. The total duration of each session was approximately 50 minutes.

7.9 Results

7.9.1 Hedonic quality

Table 7.2 shows the mean hedonic quality as reported by the participants for each condition, with lower numbers indicating a higher hedonic quality. As shown in the table, it appeared that participants reported a higher hedonic quality when they experienced the companion experience tailored to their demographic as compared to one not tailored to their demographic. A two-way analysis of variance (ANOVA) was conducted to fully determine the influence of the two independent variables (*companion experience tailoring*, *audience member demographic*) on the measure of hedonic quality. It was found that there was a statistically significant interaction between *companion experience tailoring*, *audience member demographic*, $F(1,20)=4.366$, $p=0.05$, with a medium effect size (partial eta^2 $=0.179$). This indicates that the relationship between *audience member demographic* and hedonic quality depended on the value of *companion experience tailoring*.

7.9.2 Interviews

A thematic analysis was performed on the interview data. This analysis followed the steps for thematic analysis laid out by Braun and Clarke [Braun & Clarke, 2006], similarly to the analysis conducted in chapter 6 Phase 2. However, in this case, the thematic analysis was *deductive* rather than *inductive*—that is, the thematic analysis

	Companion experience tailoring	
	18-25	*55+*
Audience member demographic		
18-25	16.67	22
55+	22	13.33

Table 7.2: The mean hedonic quality as reported by participants for each condition. Lower numbers indicate a higher hedonic quality.

was based around the hypothesis. In this case, the analysis was based around the quality of participants' user experience. The step-by-step process outlined in the Braun and Clarke paper was again used to perform the thematic analysis. The resulting report is presented in the remainder of this section, and is structured around each group of participants as presented in Table 7.1.

7.9.2.1 Participants aged 55+ who experienced the companion tailored to the 55+ demographic

Enhanced Experience

Broadly, participants in this group very much enjoyed the companion experience they saw—which was tailored to their demographic—and many found it provided an *enhanced experience*. This was one of the most distinct patterns in the responses from the participants. For example:

> It was good. I quite liked, because I'm obviously sitting here thinking, you know, got to watch this, watch that. But very nice if you're watching something you're interested in you can just flick and see, 'Ooh', you know.
>
> I think the more info... bit of information on the, you know, on the [companion screen] is useful. Particularly something like, I wouldn't know about The Striker [sic], I know nothing about it. So if you ask me to watch it, having a little bit more information in front of me, it makes it a bit more interesting than what it... just watching on the television.

Participants felt like viewing extra information on a companion screen allowed them to connect more with the content of the television programme, by allowing them to make a personal connection to the segments on screen, for example learning more about the performers' backgrounds or gaining behind the scenes information for a theatre segment. It also allowed them the freedom to choose which sections that

were of interest to them so that they could 'dive deeper', again giving a feeling of connection with the programme due to allowing greater engagement with things that personally interested them.

> I was looking at it and I was thinking, 'this is giving me the history of all the different shows' and you know, well, what she's done and that, yeah. Really interesting, yeah. Made it more interesting.
>
> That was good about, you know, relating to that and then the singer when you went through her history, born in Hulme and that, which was great.
>
> Like having a programme if you're at the theatre really, isn't it. And you see, you might be, 'Ooh, who's that?', or I've not heard her before, like the girl that was playing. I thought, 'Ooh, isn't she good,' you know, and she's been on Jools Holland.

On top of this, participants felt the companion facilitated their usual behaviours, and incorporated these behaviours into a more seamless experience for them. Specifically, many participants said that having extra information on the companion screen took the effort out of 'Googling' to find out extra things—something they would usually do themselves:

> It's actually something I would've done at home. If it's, if I see somebody's name on there, if I see something on TV that's interesting I'd have to either get, just tap the laptop and tap, then have a look. That's exactly what I would expect to come up too.
>
> Rather than going to plug it in and saying, 'Oh, now I've got to get my laptop out', you've got [the extra information] there already.

Indeed, participants liked the idea of the app for reminding them of things they might want to revisit at a later and storing content so that they could go back it to or look at afterwards—without having to 'jot things down' or try to remember them.

> The idea is actually, I think is very good because I think if there was something on and I was really keen on it, then something I could sort of look up on my tablet about it. And do they leave that on afterwards so you could go back and look it up? Which would be quite nice, so you wouldn't necessarily have to be doing it at the same time, so you could finish it and think, 'What was that all about?'

> On the television they're on screen to watch, but then I liked to look on [the companion screen] as well, and maybe you can store them? Like, so, on this one, there must be, like, a place where you can store them so if you want to reflect on them again in the future.

A number of participants had reservations about the experience—though, in both cases, the participant in question enjoyed the concept of the experience but wanted the extra information to be more personalised to their interests, in order to fully take advantage of the benefits of the experience.

> It's... hard to say. It's not that I didn't enjoy it, it's just... costume design—that's not for me, really. My Mrs would've loved all that though, she would've enjoyed it.
>
> Well, like, the descriptions, like the costumes, going through the costumes, I suppose it was alright, that, but it didn't go into the storylines like I was hoping.

Broadly, though, participants in this group very much enjoyed the experience. They felt it enhanced their usual experience of watching television by providing extra information that allowed them to connect more to the content of the television programme. Furthermore, they felt it incorporated their existing 'Googling' practices into a more seamless experience. Indeed, it sparked a desire for additional functionality to engage with the content—the ability to engage with the app again after the initial experience, and for increased personalisation of content to their specific interests.

Attention and Distraction

Participants did express some anxieties around *attention and distraction* and the difficulty of paying attention to two screens at the same time. For example:

> I mean the programme itself was really interesting. The app, maybe, I found a little distracting, because when I was looking at that—whatever was on there—I wasn't really listening enough to the programme.

Interestingly though, according to the participants, many of these anxieties lifted throughout the experience itself as they learned how the experience worked, and the cadence of the content:

> It was quite simple once I got into it, it was fine, I understood exactly what I was supposed to do—eventually.

> I think when I first looked at it, you know, I was looking through it and I hadn't listened to enough of the content and it distracted me slightly.
>
> I think for the interview sections it was only in the first one [that I felt distracted] because I wasn't used to it. So, because I wasn't used to it and I was sort of thinking what have I got to do with this and what's that, that I sort of didn't realise I could sit and watch the first bit and sort of get my head round it first before I looked at the pictures.

Given these comments, it is conceivable that participants would not suffer the same anxieties around attention if they were to experience the companion for a second time, having learned how it worked.

The concerns of the participants around attention, however, didn't detract from the desire of participants to engage with the extra content on the tablet device. Specifically, participants suggested workarounds in order to be able to engage with the extra content without worrying about distraction:

> The only thing I would like, maybe, is if I could pause... if I was at home I would pause the programme, I think, and go through some of those and then when I'd finished I'd start it up again, so I wasn't missing anything.
>
> If there was a button on the TV or something like that, where I could turn it on, I would've turned it on for Josephine and the choir, just to find out those bits.

Overall though, participants felt the amount of content was 'just enough'—that they enjoyed the content of the experience and were able to distribute their attention across it and the television, but that they wouldn't have wanted too much more:

> Well I wouldn't want an awful lot more to be honest, yeah, broke down into small—like you did for the singing—smaller, not a massive screen full of... 'cause that's too much to take in. You're trying to watch it and look at it. But a smaller description, yeah.

Indeed some participants made the astute observation that whilst the level of content was correctly pitched for them, it would not be enough for a younger audience more used to interactive experiences who would not normally enjoy this kind of content:

> I think a younger person, maybe, would want more from the app, possibly, than I would—I was happy with that—but a younger person might want more.

Although the participants demonstrated some initial anxiety at the prospect of focusing their attention over two screens, this quickly dissipated as they became used to the experience. Despite this initial caution, participants still wanted to engage with the companion screen content and suggested workarounds, such as using the tablet to pause the television. Overall, however, participants felt the amount of content was 'just enough' for them, and some predicted that younger viewers may want more or different content.

Traditional

A minority of participants had reservations about using another device when watching television at all, preferring a more *traditional* television experience. There was an expectation that a television should be able to entertain you without any accoutrements:

> If I'm watching a programme I'm hopeful that programme's going to grab me enough to not want to look away from it.

Indeed, even when the companion screen fulfilled participant expectations, it did not necessarily relieve the feeling of not wanting to use a secondary device:

> I thought the tablet would be like a dictionary. What it all meant. Basically, like the last one, the singer, it was telling you where she comes from where she was born, in Hulme, but the thing is, I still couldn't imagine myself at this moment in time to be sat at home, tablet in my hand, and watching the TV at the same time.

7.9.2.2 Participants aged 55+ who experienced the companion tailored to the 18–25 demographic

Poor Experience

Participants in this group did not enjoy the companion experience they saw—which was tailored to a different demographic—and many found it provided a **poor experience**. For example:

> It was not even, nothing, it wasn't linked at all to that programme.
>
> The first bit, Alice in Wonderland, I found it—what was coming up was I found it a little bit, like, kiddie-like. It was like—it didn't draw my attention. I was more interested in what they were saying about Alice in Wonderland [on the television] so I only glanced at it throughout.

Indeed, for some participants, the companion experience they saw was beyond comprehension, and they assumed it was for some purpose completely separate to the television programme:

> Well there was absolutely no content on there other than some graphics which was going through it, and I wasn't sure if that was part of the programme or just to get me immersed into actually touching the, touching the tablet.

Interestingly, many participants did not enjoy the experience partly because they perceived that the experience was not meant for them in some way, or did not capture their interests:

> That was, for me, geared more towards the younger end because if you had somebody who was younger now they would've probably gone [makes tapping motions with fingers] and start trying to find out more and start trying to play the game because, 'Oh they're doing a lot of chatting I'm not interested in that'.
>
> The playing side for the Alice thing was not for me. You know, once I realised what happened every time—well, I'm not much of a game-player.

As demonstrated here, the participants in this group did not enjoy the companion experience they saw, as predicted in the hypothesis. Their reactions showed that, amongst other things, they either did not understand the purpose of the companion app, or perceived that although some may enjoy it, it was not for them.

Attention and Distraction

Similarly to the previously reported on group, many participants raised concerns around *attention and distraction*—though these concerns were slightly different in nature in this case. Many participants reported being very distracted by the companion experience, contributing to their overall feeling that it provided a *poor experience*. For example:

> You know I found the, sort of, game thing, as I said, I found that a bit—I don't know, distracting, I suppose.
>
> Every time something came up I thought, 'Mmm.' I just accepted it at first, 'Oh, something different's come up.' And being a bit slow I then thought, 'Ah, well maybe you can do something with this.' And of course then, so every time the page changed I had to then discover what I could do with it, which I found was a little bit distracting.

Specifically, in this case, participants felt they were being forced to pay attention to a screen which did not enhance their experience in any way—and was therefore simply a troublesome distraction from the main content:

> I felt as though I had to see what it was but I was probably being pulled—I was pulled away when I wasn't actually as interested in it than what was on the main screen anyway.
>
> It's just an experience I'd not had before, so at first I went a bit too far away and started playing with characters from it and I had to pull myself back a bit because I was more interested in the programme and I was missing it.

As such, participant concerns about being distracted did not originate from an anxiety about being able to pay attention to two screens at a time. Indeed, many participants were keen to emphasise that they enjoyed the concept of using a companion application, and felt equipped to manage their attention of two screens, but that this experience wasn't for them:

> Yeah, 'cause I found you could look at [the tablet] and still watch the television. It wasn't too hard to take in—I mean, I'm 70—it wasn't too hard to take in. It was pretty straight forward to watch.
>
> You know how some programmes have you know, have information like that [motions moving along] underneath and you feel as though you. . . you can't not read it, can you? Whereas with [the tablet] you can pick and choose, so you know, 'Oh, so this grabs me, well what is this?' So you can cope with both.

Attention and distraction was again a theme, but in this group participants found the companion app to be distracting, which detracted from their user experience. They felt forced to pay attention to a screen which did not enhance their experience. However, participants also expressed positive feelings towards the idea of a companion experience in principle.

Extra Information

As mentioned above, many participants were keen to emphasise that they enjoyed the concept of a companion experience in general—and explained what they would have liked the companion experience to deliver instead. All of the participant explanations were based around the same thing—wanting to see *extra information* on the companion screen. For example:

> I felt it could've gone further in looking into, I don't know why, perhaps it was just me who was interested in that aspect of that item, that I wanted to be able to find out more about the book, the Skriker book.
>
> I wanted to know background information.
>
> For example, if for the Alice in Wonderland it would have come up with more with the characters in that, I would've like, yeah, got more into it.

This theme was also present in participants' enjoyment of the companion experience when it accompanied the music performance segments, which contained the extra information they wanted—as the companion experience displayed extra biographical information about the performer in both versions of the companion experience when it came to the music performances. For example:

> The one about the Manchester singer—that's the sort of thing I'd do, 'Oh, what was her album called?' You know?
>
> The choir and the actual artist, Josephine. Having that background information was kind of like, 'Right, okay.' It made me more interested in what was going on.

Despite not enjoying the experience presented to them, the participants in this group emphasised that they enjoyed the overall concept of a companion experience, and had a common suggestion of the kind of companion experience they would have preferred—one that provided *extra information*. Interestingly, this backed up the hypothesis in that participants specifically requested an experience of the kind that the hypothesis predicted they would enjoy. Their claims were backed up by their enjoyment of the music performance segments, which contained the informative companion content they desired.

7.9.2.3 Participants aged between 18–25 who experienced the companion tailored to the 18–25 demographic

Mixed Experience

There was a mixed response from participants in this group to the companion experience they saw—which was tailored to their demographic. Participants in this group seemed to report a *mixed experience*. Although there were many areas where participants emphasised their enjoyment of the experience, this was not universal, and many enjoyed some aspects of the experience over others, as demonstrated in this theme.

Participants expressed their enjoyment for the game-like interactive content that accompanied the interview segments in this condition:

> The Alice in Wonderland one, I remember, that was good. I, yeah, I just like that there were lots of different things to keep me engaged.
>
> The programme section of the Striker [sic] was more interesting in general. Yeah, 'cause I quite like that sort of stuff, dark sort of productions. I used to do drama as well and I used to, I was involved in that sort of dark side of it, so that was quite, sparked my interest as well. But as well, because there were quotes on there [points to tablet], trying to find out how they were linked, then obviously they came up at the end of that section, so that was well good.

In particular, participants enjoyed that the accompanying experience in these cases was linked artistically to the main programme, not just informatively:

> I thought it was good that it was different because it was a clear distinction. Like the apps for the Striker [sic] and Alice in Wonderland were more about, it made you think how they were linked to it as opposed to being so blatant with just, like, a blurb about what you were watching. You could tell that they were linked in like an artistic way as opposed to just, like, an informative way.

Indeed, participants emphasised their pleasant surprise that the companion experience did not only contain extra information:

> I didn't know exactly what was gonna be on the tablet. Actually I think I assumed it was gonna be, like, just info, loads of stuff to read—I don't know why, that's just what I assumed. The fact that it was, like, more interactive-type stuff was fun. It made it more fun.

However, as stated above, not all participants universally enjoyed the companion experience they saw. For example, participants talked of enjoying some of the accompanying sections of interactive content and not others, perhaps showing a need for a deeper tailoring of the companion experience to a user's personal tastes. For example:

> I quite liked one section when the Striker [sic] was on 'cause it was similar to the Alice in Wonderland thing but it was a bit more interesting. 'Cause there's quotes and you kind of had to find them by interacting with it, as opposed to quite dumbed down acts on the first section.

Furthermore, a minority of participants did not not enjoy the more game-like or artistic parts of the companion experience at all:

> I think the idea's really good. I think some of the content that it was giving, so the Alice in Wonderland, like the graphics thing, I think it was okay but I think it was a bit distracting from the programme itself, if that's what you were doing, watching alongside it.

Indeed, these participants indicated a preference for more informative experience. This was indicated both directly in the comments of the participants, and by their enjoyment of the content that accompanied the music segments, which was more informative:

> I'd prefer personally more informative content than something which just distracts me from watching.
>
> When some of the artists were on I was saying to myself, 'Oh, she sounds really good, I wonder what she does and where she's from.' The information was there, so then I was like, 'Okay, so she does this, she does that, she's from Manchester,' so that was good.

In summary, participant responses to this experience were mixed. Some participants in this group greatly enjoyed the companion experience they saw, and were particularly struck by the interactive elements it contained. Some participants, however, only enjoyed certain of the interactive segments and not others, indicating a need for a more deeply personalised experience. Further, some participants did not enjoy the interactive aspects of the experience at all, instead desiring more informative content—similar to that of the experience tailored to the older demographic.

Progressive

Participants in this group were particularly enthusiastic about this kind of experience though, and were keen to engage with *progressive* television experiences—sooner rather than later.

All participants stated that the experience reminded them of their current second screen behaviours; using a phone or tablet whilst watching television:

> Like, I'm the sort of person that would usually, these days, pretty much always on my phone or my laptop when I'm watching telly. So to have, like, something specific to the programme if that makes sense. Something specific to the programme to be doing.

> The upcoming generation are good at multi-tasking because, I'm not gonna lie, I'll sit watching Game of Thrones and I'll be checking Facebook on my phone at the same time.

Some then went on to explicitly state that this experience was preferable to their usual second screening behaviour. Participants believed that their usual second screening behaviour would have detracted from the programme and explained that this experience—the one that was tailored to them—allowed them to engage more with the programme than they would have done without the companion experience:

> I don't think it detracted from it. I think it actually prevented what I would usually do, which is, like, get distracted by looking at something unrelated. It brought me more into the programme than away from it.

Many of the participants were excited by the prospect of a strong link between the television screen and their personal devices:

> I didn't know they were going to be directly linked to each section of the, of the programme. I've never really used an app that did that, sort of, that's probably why I didn't really expect it that much. I expected it to be more of a distraction as opposed to, like, integrated with it.
>
> It seemed like it was, it had been very well, like whatever was going on on the tablet was like well thought through clearly, and planned to what was going on. It wasn't like just a bunch of random, trying to think of an appropriate word—random stuff, you know. It was like, 'Oh that makes sense with that and that makes sense with that.'

Indeed, many saw the programme and the companion content as a singular experience, with the balance between the two being described as 'natural':

> It wasn't like two separate things, it was a one experience from beginning to end. Like, so it was like I was being taken on a journey, you know. It was an experience.
>
> I didn't feel under pressure to do it. I was kind of from, from the get-go I was, like, anticipating what was going to, going to happen with the app in relation to the programme so it wasn't really like a pressure. It's more quite natural.

In this group there were few concerns around attention, as many participants felt that they did not feel pressure to look at either screen and could choose what they wanted to engage with:

> I don't think there was a pressure, because there was nothing, like, there wasn't a hard pressure, like, nothing, like buzzed, or like made a noise with the companion experience saying like, 'Look at me, look at me!' There was no annoying stuff. It like, it like felt quite natural.
>
> So the, what's actually going on over there [on the television] is clearly the main thing, yeah absolutely. But having something here [on the tablet] is fantastic so that you don't have to be completely engaged over here at all times, you can look at it when you want, and it's like a complete sort of thing.

In summary, participants in this group expressed that they were more than ready for a more *progressive* television experience. They use a second screen in their current viewing behaviour and it was noted that the experience of this study may be preferable to their current behaviour; allowing them to engage more with the programme. Participants were enthused by a strong link existing between the two screens, creating what they felt was a singular, natural experience. This demographic was not particularly concerned by matters of attention and enjoyed being able to choose what to focus on during the experience.

7.9.2.4 Participants aged between 18–25 who experienced the companion tailored to the 55+ demographic

Poor Experience

There was a negative response from participants in this group to the companion experience they saw—which had been tailored to a different demographic—and many found it provided a *poor experience*. Most participants felt there was not enough companion content on the secondary screen to maintain their interest and keep them entertained:

> I think I found myself, so when I'd like already looked at the eight or nine things that were on one of the parts, because the content on the video was still going on and I'd already looked through them all, I found myself looking through them again, even though really like I'd probably absorbed all the information I could do the first time around.
>
> I did find I went through it very fast, and then it was just there, and then I was just watching the programme.

Some felt that the companion content accompanying the performance sections were particularly notable for having a low amount of content:

> In the second one, because there was only two pages, and I noticed myself go back a page, because I was like, 'Oh, I've run out, give me more.'
>
> When you have, like, the little information telling you more about her [the singer], you want to know more.

Some participants initially anticipated a more interactive experience than the informative one which they received:

> I thought it was going to be more of an interaction between that, but it was more of the tablet giving me information.

Some explicitly identified that this was a disappointment and that they would have preferred more interactive content:

> The opening for the Alice one—there was like an 'enter' with like a cartoon, like, 'Oh this is cool, it seems like a bit like a game,' and then it was just like next, next, next and I would've, like, rather it be like, 'Ooh click here,' and like this and this and this [motions tapping], like, dipping in and out, and like a bit more oomph rather than just, like, a picture.

Many participants reflected that the experience they received would be well-suited for an older generation. Interestingly, this group was unaware that the experience they had received was in fact tailored to an older demographic.

> I think it'd appeal more if you were a bit older and perhaps and if you were, you know if you were middle-aged or something like that.
>
> For me, I guess like, it felt like more something for an older generation. I think 'cause I'm guess I'm so used to, like, apps and, like, social media being so mad, like dun dun dun dun [makes swiping motion], in your face having to do the swipe; that it was just like the one nice picture and, like, the swiping just felt very like what a relaxed, older person might enjoy.

They also identified that a tailored experience for a younger generation would require something more than simple informative content:

> Our generation now, we wanna be more in control, like more, more interaction with, like, a TV. So if you had, for example, my little sister, she

> loves interacting with, like, everything; something like that she's gonna be even more, like, engaged in terms of what she's watching.

Participants in this group had a poor experience. They articulated that this was partially due to what they perceived as a low amount of companion content. Additionally, many expected, and some explicitly desired, a more interactive experience. This experience was tailored to an older demographic, not the younger group that received it, and many participants deduced that this experience would be more suitable for an older generation. They identified that a younger generation would require something more from the experience.

Progressive

Many of the participants of this group expressed that they enjoyed the concept of a linked two screen experience, even though they felt that the exact experience they had received was a poor fit. Similarly to the previously reported on group, this group were keen to engage with *progressive* television experiences—sooner rather than later.

Many participants enjoyed how the two screens were strongly linked:

> I think it's cool how it changed with what was on the screen.
>
> What I did think was cool was obviously the timings of it, that when you're watching the programme it moves to a different section.

Participants were also comfortable with the idea of a companion screen experience and many felt that they were not under pressure to look at either screen:

> I didn't feel the pressure. I think was good, yeah. 'Cause in the first part it was more like little pictures as well, so I kind of got the idea while I'm listening, kind of looking through.

Indeed, the use of a companion screen alongside television viewing reminded them of their current viewing behaviour at home. For some this was a favourable comparison, for example, the companion content being more convenient than independent browsing. For some, however, they felt that the experience they received was not a sufficient improvement on what they currently experience at home due to the aforementioned perception that there was not enough content to keep them engaged:

> Because you could use internet for that too but you don't get it straight away, like search, it won't just pop up right away, and for me, like I

> would, if you were a TV act I wouldn't know your name so I can't look that up on the internet.
>
> And I think that's what the app was perhaps lacking, is that once you'd looked at the five or six things, or two or three things, that there was, there was no more new content being generated with it. Whereas obviously on social media if you're on like a hashtag for this programme, for example, you've got, it's constantly going through.

This group enjoyed the concept of a companion experience even though they did not enjoy the exact experience they saw—they were eager to engage with *progressive* television experiences. They particularly enjoyed how strongly the two screens were linked and were very comfortable with using two screens at once. In fact, the experience reminded them of their own current at-home viewing behaviour, though they perceived that the level of content was too low (in this version of the experience) to compete with their current behaviours.

7.10 Discussion

The qualitative results from this study indicated that participants had a far better user experience when they experienced the companion experience tailored to their demographic as opposed to when they experienced one not tailored to their demographic. This is backed up by the significant hedonic quality result, which demonstrated that participants reported a higher hedonic quality when they experienced the companion experience tailored to their demographic as opposed to when they experienced one not tailored to their demographic. All of these results support the hypothesis, **H**.

Specifically, the qualitative results showed that the difference in the way the 55+ demographic reacted to each companion experience was very stark. The members of this group who experienced the companion tailored to the 18–25 demographic rejected the companion, and explicitly suggested they would have preferred an experience like the one tailored to their demographic. And indeed, the members of this group who experienced the companion tailored to them, the 55+ demographic, broadly very much enjoyed their experience. The qualitative results were somewhat less clear when it came to the 18–25 demographic. While the members of this group who experienced the companion tailored to the 55+ demographic outright rejected that experience, which had been so successful with the 55+ participants, they had mixed feelings about the companion experience tailored to their own demographic—it was not a universal success. Having said this, many enjoyed some aspects of the more interactive experience and liked the concept of a more interactive companion

experience in general—and it certainly received a much warmer response than the companion tailored to the 55+ demographic.

One interesting finding, however, was that, although each group reported a better user experience if they experienced the companion experience tailored for their demographic, there were subtle variations of opinion within the groups. This suggested a need for a deeper tailoring to account for the personal tastes of individuals—that is, using the companion experience to provide an even more personalised experience.

7.11 Limitations

Similarly to chapter 4, the limitations of this study centre around the nature of the experience under study, a television programme. For example, one particular limitation is the genre of the television programme and the subjective preferences of the participants for that genre. Particularly in this case, where the usual audience for the television programme under study mapped directly onto one of the groups under study. However, useful and significant results were found for both of the groups under study. Furthermore, limitations of genre are a usual consequence when studying television experiences, and should not preclude such study.

7.12 Conclusion

The study presented in this chapter sought to investigate the hypothesis that *a companion experience to a television programme can be tailored to a particular demographic to provide that demographic with a better overall user experience.* There were several positive results indicating that this was in fact the case. As such, it is possible to state, with some confidence, the following design guideline for producers and designers of companion screen experiences:

> **Designers of companion screen experiences should consider the demographic groups of the users for whom the experience is intended, and tailor multiple experiences to each demographic**

This guideline is the culmination of both chapter 6 and chapter 7, and has important implications for broadcasters, as it presents the opportunity of engaging wider audiences in television programmes by providing companion experiences for multiple audience demographics, allowing for a scenario like the one involving David and Jenny outlined at the start of this chapter. However, as discussed in section 7.10, future work should involve investigation of whether a deeper level of tailoring of the

companion experience, to the personal tastes of the user, improves user experience further.

Chapter 8

Conclusion

8.1 Discussion

The main aim of this thesis was to discover how it is possible to design companion screen experiences that are genuinely new, with the main research question being:

RQ How should companion screen experiences be designed?

This research question led to the specification of four research objectives (**RO**s), which were designed to address the central research question within the scope of the thesis. These were:

RO1 To explore the concept of smart wallpaper as a platform for innovative living room experiences (see chapters 3 & 4)

RO2 To specifically explore the concept of smart wallpaper as a platform for companion screen experiences, to begin the focus on companion screen experiences (see chapter 4)

RO3 To uncover a useful hypothesis for study around companion screen experiences, using the findings from **RO2**, interviews with television professionals and a study with audience members (see chapter 6)

RO4 To investigate the companion screen experience hypothesis formed in **RO3** (see chapter 7)

Addressing each of these research objectives led to the major contributions of the thesis. The thesis made two major contributions: a practical and a theoretical contribution.

A practical contribution was made through the development and evaluation of a number of companion screen experiences—the findings from these evaluations represent this contribution.

In chapter 4, a comparison of a novel type of companion screen (smart wallpaper) to a traditional companion screen (a tablet) was presented, and evaluated. Specifically, this chapter aimed to discern how using the space around a TV to deliver a companion experience impacted a user's experience when compared to a companion experience delivered more traditionally—on a tablet. It was found that participants adopted an experience-disrupting monitoring strategy in the tablet condition, but not in the smart wallpaper condition. Equally, it was found that the tablet condition induced a significantly higher mental workload in participants than the smart wallpaper condition. That is, it was demonstrated that, in fact, using the space around a TV to deliver a companion experience positively impacts a user's experience when compared to a companion experience delivered on a tablet. This builds on the work in this area in a number of ways. It adds to the current study around using living room walls as a canvas for television and associated media, termed 'augmented home entertainment' by Vatavu [Vatavu, 2013], by providing a comparison of using wall space as a canvas for a companion experience versus using a tablet, and thereby demonstrating some of the benefits of using living room walls as a canvas for television and associated media. On top of this, it contributes to the work in the field around attention [Holmes et al., 2012; Brown et al., 2014], and specifically provides compelling evidence that users do indeed adopt a disruptive monitoring strategy when engaging with a companion experience on a tablet device, as initially hypothesised by Holmes et al. [Holmes et al., 2012]. This contribution therefore provides a valuable contribution to this field, addressing the central **RQ**.

However, as discussed in chapter 4, it was suggested that a more thorough investigation of the orchestration of companion experiences was needed, as the positive response to smart wallpaper as a companion screen could have been due to the fact that it simply mitigated some of issues of a poorly orchestrated experience. This was addressed in chapter 6 and chapter 7. This was firstly addressed by using the novel approach of involving producers and users in the very initial stages of developing a companion screen experience, as one possible way of generating design guideline[s] for a companion experience up front. This is presented in chapter 6—and a potential guideline was uncovered for further investigation in the form of a hypothesis for testing. That hypothesis was: *a companion experience to a television programme can be tailored to a particular demographic to provide that demographic with a better overall user experience.* This hypothesis was then put under test in chapter 7, in order to rigorously validate this design guideline for producers and designers of companion

screen experiences. It was found that this is, in fact, the case—tailoring a companion experience to a particular demographic improves the overall user experience of that demographic. Specifically, the qualitative results and the significantly higher hedonic quality that participants reported when experiencing a companion experience tailored to their demographic indicated that different companion experiences should be provided to different demographics in order to enhance the enjoyment of a television programme for audience members from that demographic. This has implications for broadcasters, as it presents the opportunity of engaging wider audiences in television programmes by providing companion experiences for multiple audience demographics. This rigorously-validated design guideline and implication represents a real contribution to this field, addressing the central **RQ**. This work adds to the work in this area in several ways. It takes the novel approach of involving television producers and audience members at the earliest stages of companion experience design, which has been done only rarely in the field. One exception is the work of Nandakumar and Murray, who involved the writer of the television programme *Justified* in the design of their companion experience to that programme [Nandakumar & Murray, 2014]. Even in this example, though, the interview is mentioned only briefly by the authors—and it was performed *after* they had decided upon the form of their companion experience, and the television programme it would accompany. On top of this, this work builds on the work in this area by rigorously evaluating the potential of companion experiences to provide personalised experiences. This potential has been recognised in other work [K. Murray & Parnall, 2013], though it has not been explicitly evaluated. As such, the work of chapter 6 and chapter 7 represent a valuable contribution to the field.

These findings of course have their limitations. Many of the limitations of this work stemmed from the nature of the experience under study—i.e. television watching as a leisure activity. For example, it was noted in chapter 4 that watching only a short clip of a television programme is not the usual way users would watch a television programme, detracting from the ecological validity of the study conducted in that chapter. Indeed, it was further noted that watching a television programme in a lab space, whilst wearing large eye-tracking glasses, also detracted from the ecological validity of the study. Ecological validity is a particular challenge for studies of this nature—studies that are concerned with leisure activities—though it is an important one, as the leisure aspect is a key part of the experience under study. As a result, the researcher made a conscious decision to attempt to achieve a higher level of ecological validity in subsequent user studies, as a matter of best practice. All subsequent user studies were conducted in spaces that had a 'living room' feel, and all subsequent stimuli were concerned with television programmes that were at least half hour long, rather than ten minute clips from television programmes. This greatly increased the ecological validity of the subsequent studies conducted in the thesis, namely those in chapter 6 Phase 2 and chapter 7.

A further limitation stemming from the nature of the experience under study was also noted at points throughout this thesis—that of genre. The genre of the television programme under study, and particularly the subjective preferences of the participants for that genre, can limit the findings of studies concerned with television experiences. As stated at points throughout the thesis, however, this is a natural consequence of studying television experiences, however, and should not preclude such study. This limitation, however, led, in part, to the decision of the researcher to adopt more qualitative methods in the second half of this thesis. In other words, it became clear that it was not possible to evaluate the user experience of companion experiences using quantitative methods alone when having to consider nebulous limitations like the subjective preferences of participants for the genre of television programme the companion experience accompanied. It was considered that capturing the richness of the experience of individual users using qualitative methods was necessary in order to fully evaluate the user experience of a leisure activity given the complex nature of things like preference for genre, whilst quantitative methods could provide a useful support to the qualitative results captured.

Indeed, the researcher's endeavours with regard to limitations makes a theoretical contribution. That is, a theoretical contribution was made through the researcher's choices of study design and methodology to evaluate companion experiences to television and, specifically, through the evolving rationale behind the design choices and methods employed.

A further theoretical contribution was also made through the definition of a companion screen experience within the context of all the additional media activities that television users may engage in to supplement the programmes they watch. This taxonomy was presented in chapter 5. This taxonomy was created in order to define exactly what was meant as a companion screen experience for the remaining chapters of the thesis, and differentiate it from other additional media activities for the benefit of the researcher, and was presented for the benefit of the reader and other researchers. As stated in the taxonomy, researchers currently use a small set of terms to describe the diverse range of additional media activities that users engage in relative to particular television programmes. This can make the body of work in the field difficult to synthesise, and can mean that the same terms are used to describe additional media activities that are actually very different in nature. This leaves the body of work open to the drawing of potentially erroneous generalised conclusions. The terms used have included 'second screen' [Schirra et al., 2014; Neate et al., 2015; Geerts et al., 2014], 'second screening' [Doughty et al., 2012; Courtois & D'heer, 2012], 'second screen experience' [Basapur et al., 2012; Torpey & Bloomberg, 2014], 'media multitasking' [Brasel & Gips, 2011; Brumby et al., 2014], 'companion content' [Schirra et al., 2014; Brown et al., 2014] and 'companion experience' [Basapur et al., 2012; Nandakumar & Murray, 2014], amongst others. These terms do not necessarily refer to what is expected—and common sense conclusions on the distinctions between the terms are dangerous to draw, given that

single terms have been applied to very different additional media activities. Thus, a beneficial theoretical contribution is made via the taxonomy presented in chapter 5, which presents a clear language for referring to the additional media activities of all types that users engage in relative to television programme, and differentiates exactly what is meant by a synchronous, orchestrated companion screen experience (the subject of this thesis) from other types of additional media activity.

A final contribution of the research presented in this thesis is the many potential directions for future research that the thesis has yielded. For example, there are many potential avenues for future work in the insights of the television producer in chapter 6, not all of which were possible to address in this thesis. Of particular interest is the potential avenue for future work uncovered in chapter 7—which suggested that, whilst tailoring a companion experience to an audience member's demographic provides an improved user experience for that audience member, a deeper tailoring of companion experiences to account for the personal tastes of individuals could provide a more improved user experience, beyond what tailoring to demographics alone could achieve. This strengthens the implications for broadcasters mentioned above, as it presents the opportunity of not only engaging wider audiences in television programmes by providing personalised companion experiences, but also has the possibility of making the shared television experience personalised, whilst maintaining its shared-capabilities.

8.2 Conclusion

This thesis aimed to examine how it is possible to design experiences that truly add value to a television experience, by asking the central research question, *how should companion screen experiences be designed*? Multiple contributions were made to this end, both theoretical and practical as detailed above. These findings, contributions and their implications provide important considerations for broadcasters interested in delivering companion screen experiences, as well as a number of exciting possible avenues for future research.

Appendix A

Companion to Chapter 3

A.1 Paper materials for study

BBC Future Media

Consent Form

BBC R&D 'Smart Wallpaper' Game Study

Introduction

The BBC invites you to participate in a research study relating to an experimental household media concept we are calling 'Smart Wallpaper'. The purpose of the study is to understand how games on this new platform compare with games on mobiles and tablets.

Your involvement in this study will require you/your child to spend some time playing a game themed around CBeebies on this experimental entertainment platform. We will then ask you a few questions about your experience, via a questionnaire and discussion.

The study will be conducted by BBC staff.

The session will involve:

1. An introduction to the concept of Smart Wallpaper.
2. The use of our Smart Wallpaper game.
3. An interview with a BBC study facilitator.
4. A short discussion.

Please understand that this is a test of our service – not you. All information supplied during the study will be suitable for children. The BBC reserves the right to make minor changes to the conduct of the study.

Consent

We will ask you/your child to provide the BBC with a name during the study.

We will be filming & recording your/your child's participation in the study.

The BBC may use this information, including any video or audio recordings, for statistical/summary purposes only. You/your child's identity will be protected at all times. The BBC will ensure that your name/your child's name will not be associated with any contribution made in any recording.

The BBC will not use your/your child's personal details for any purpose other than this study, nor will the BBC pass any personal details relating to you/your child to any third party.

The BBC may make the results of this study publicly available. The results *will not* be based on your child *individually*, but based on patterns observed on the participants as a *whole,* ensuring that your child's responses will not be made publically available. This includes any other personal data relating to you/your child such as video or audio material.

You/Your child grants to the BBC all rights in your/their contributions to the study, for the use set out in this Consent Form in all media and waives irrevocably any moral rights you/they may have in your/their contribution.

You agree that, save as publicly announced by the BBC, any information relating to this trial is confidential, and that all information collected by the BBC concerning you/your child's participation is anonymous and confidential.

You reserve your/your child's rights to withdraw from this study at all times.

BBC Future Media

Contact details

Email: Rosie.Campbell@bbc.co.uk

Participant acknowledgement

I have read the description of the study and agree that I will participate on the terms set out above.

Name:

Signature:

Date:

I, the parent or guardian of the child/children named below, have read the description of the study and agree that my child/children may participate on the terms set out above.

Child's name:

2nd Child's name (if applicable):

Parent or guardian's name:

Parent or guardian's signature:

Date:

Appendix B

Companion to Chapter 4

B.1 Paper materials for study

Participant Information

Thank you for considering taking part in this study. It will be a great help to the University of Bath's and BBC Research & Development's research into the future of living room entertainment.

How the study will work

The lead researcher will set you up with a pair of glasses - these will be used to gather eye-tracking data as you complete the task. You will then be asked to watch 2 television clips from the BBC television programme 'Autumnwatch'. During both clips you will be also be able to watch related content on another screen. After each clip, you will be asked to complete a short questionnaire. You can take as long as you wish to answer the questions.

This should take approximately 30 minutes.

Participant Consent

Please read the following information carefully. The information in this consent form is provided so that you can decide whether you wish to participate in our study. It is important that you understand that your participation is considered voluntary. This means that even if you agree to participate you are free to withdraw from the study at any time should you so wish.

During the study you will be videotaped so that we can observe you as you complete the task. These videotapes will be stored securely and viewed only by project members, after which they will be destroyed. All information, visual, auditory or otherwise supplied by you will be entirely confidential. In the event that data generated by the study is published, all data will be made anonymous. The lead researcher in this study is Charlotte Hoare, who can be contacted at c.m.hoare@bath.ac.uk. For more information about this project, please visit *http://www.bbc.co.uk/rd/projects/unconventional-screens*

Name: _____

Gender: _____

Age Range (please circle): 18-25 26-30 31-45 45+

Occupation: _____

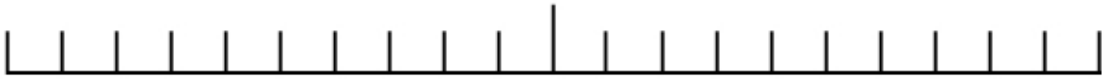
By providing my signature, I agree to participate in this study and understand that I may withdraw my consent at any time

Signature: _____

Date: _____

Mental Demand

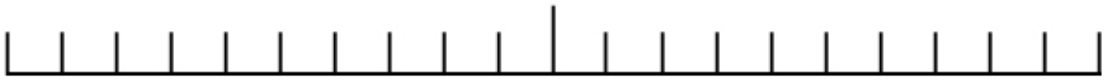
How mentally demanding was the task?



Very Low Very High

Physical Demand

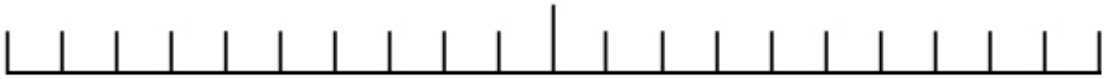
How physically demanding was the task?



Very Low Very High

Temporal Demand

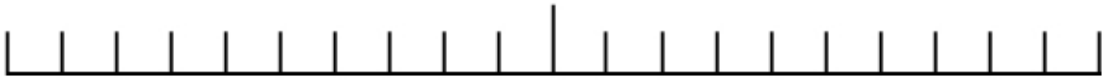
How hurried or rushed was the pace of the task?



Very Low Very High

Performance

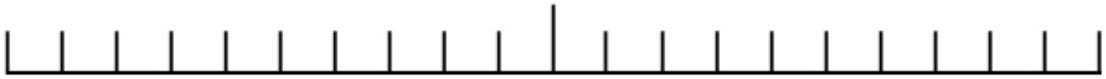
How successful were you in accomplishing what you were asked to do?



Perfect Failure

Effort

How hard did you have to work to accomplish your level of performance?



Very Low Very High

Frustration

How insecure, discouraged, irritated, stressed and annoyed were you?

Very Low Very High

Appendix C

Companion to Chapter 6

C.1 Paper materials for Phase 1 study

Participant Information

Thank you for considering taking part in this study. It will be a great help to the University of Bath and BBC Research & Development as part of their research into multi-screen experiences.

How the study will work

The study takes the form of 2 interviews. These interviews should last approximately 30 minutes and 60 minutes respectively.

The first interview is designed to get your thoughts on what you see as the opportunities and challenges for storytelling over multiple screens. It will consist of a number of questions.

The second interview is designed to uncover moments when you might intervene in a television programme and add extra content on an auxiliary screen. Together with the researcher, you will go through a clip from a television show and discuss appropriate moments to intervene.

Participating

Your participation in this research is considered entirely voluntary, and you are free to withdraw from the study at any time should you so wish.

During the study, the interviews will be recorded using a Dictaphone so that we can analyse the data. This audio recording will be stored securely and viewed only by project members, after which it will be destroyed. All information, auditory or otherwise, supplied by you will be entirely confidential. In the event that data generated by this interview is published, all data will be made anonymous.

Contact information

If you have any questions about any aspects of the study, or you would like to know the eventual results, the lead researcher in this study is Charlotte Hoare, who can be contacted at *charlotte.hoare.ext@bbc.co.uk*.

Participant Consent

By providing my signature, I agree to participate in this study and understand that I may withdraw my consent at any time.

Name: _____

Signature: _____

Date: _____

Participant Details

Age: _____

Gender: _____

Occupation: _____

Interview Schedule

Interview 1

Introduction

I'd like to start by introducing some of the possibilities that ubiquitous handheld devices bring to the world of entertainment. Imagine if your second screen could help you make sense of complex stories by providing family trees, maps, and character biographies. You encounter a character you don't know well, and all you have to do is look at your second screen and get a summary of everything you should know at this stage of the story, with no risk of spoilers. Or imagine if you could experience things from a character's point of view for a particular scene on your tablet. The opportunities are quite exciting.

Questions

Do you have any initial thoughts on these scenarios?

How do you feel about them? Excited? Apprehensive?

Can you see yourself working to deliver the sorts of experiences described?

What do you think the challenges would be?

Can you think of any possibilities these scenarios didn't cover?

Transition

Clearly, there are some exciting opportunities. There are also some challenges. Some of the challenges we've seen include: users feeling under pressure to attend two things at once, users missing content on one screen while they're attending another, or users reporting that it isn't very relaxing.

Questions

Do you have any initial thoughts on these challenges?

Can you think of any ways you might deal with them?

Closing

Thank you for your time. In our next interview, I'd like us to go through a television programme and discuss at what moments you might intervene and show content on an auxiliary screen.

Interview 2

Introduction

We'll watch the TV clip together several times, and get a sense of where you might intervene and show content on an auxiliary screen. At each stage, I'll ask you some questions:

Questions

Why here?

How would you intervene?

Is there something specific you have in mind to show on an auxiliary screen?

Closing

Many thanks for your help and time throughout this process. Please feel free to contact me at any time if you have any questions.

C.2 First interview transcript

[THE RESEARCHER BEGINS THE RECORDING]

Researcher: So, I am a PhD student here at BBC R&D and I'm also at the University of Bath-so Bath University registers my PhD but I'm doing it full time at the BBC, so it's a bit of a strange situation. It's essentially to give academic degrees more of an industrial focus I suppose.

Participant: Yep.

Researcher: So my work is based, I'm from an engineering background and then, just before my PhD, I specialised in Human-Computer Interaction, and, yeah, that was perfect for what R&D were looking for at the time because they're interested now in multi-screen experiences, which, erm, so it's the idea that, so we're seeing a lot of behaviour at the moment with people kind of using their personal devices whilst they're watching TV, and the home sort of being full of lots of these screens that we could be potentially be using to deliver more exciting experiences. So it's kind of, so my PhD is sort of looking at how we can leverage the fact that homes are now full of screens to bring them together and deliver unified experiences. Does that make sense?

Participant: Yep, no, that all makes perfect sense...

Researcher: Brilliant.

Participant: ...to enhance the current service.

Researcher: So there has been some work done on this before, in the sort of academic community and within the BBC to a certain extent, but, so, I think I might have mentioned this to you, to my mind the main limitation is that these things are never really co-designed with the people who would actually be making them or sort of have the most experience of making entertainment experiences as we currently deliver them—which is really the purpose of these interview really...

Participant: Yep, yep.

Researcher: So, yeah, I was delighted that you wanted to take part!

Participant: No, sure, it kind of erm, [name of colleague] suggested this to me and it sounded interesting and I'm quite interested in these new frontiers myself, there's, you know, there's some narrative resistance in certain areas of interest institutionally around the organisation but, er, you know, it's an inevitable direction of travel so might as well just erm scope it out and find out as much as I can

Researcher: Yeah, exactly.

Participant: . . . before it gets swept away with the Jetsons!

Researcher: Yeah and I mean that's sort of the good part really of having an R&D department to look into those sorts of things, like pre-empt them a bit, and decide if something's likely or maybe it won't happen erm, and er, yeah, I think we should liaise a lot more outside of the department as well so yeah.

Participant: Yeah OK brilliant, so you have some questions?

Researcher: So erm yeah, so I think I might have told you that this will be, like hopefully, this will be done over two interviews and they'll be slightly different. So at the end of this one I'll maybe talk a bit more about what I hope to do in the next one, but for this one it is just sort of a chat and it's really sort of just trying to get your thoughts on what you might think are the opportunities and the challenges that you could foresee for someone like you, erm, or the teams that you work in kind of coping with this sort of thing. Erm I mean the very first thing is simply: what are your immediate thoughts when someone says multi-screen TV to you?

Participant: Yeah, erm, OK, well, if that's the first question, my immediate thoughts are definitely that it's er, as I just said, where things are definitely heading—it is the future, and there's no point ignoring that. The problem for me in my professional capacity is that I work in factual television in mostly arts and history based content and that skews a lot older in terms of the audiences. So you know, the average age of somebody watching my programmes is probably in their mid–60s which, you know, there's just a generation who are more resistant towards the idea of adopting more screens, erm, I think. . . you know something, it's all about fragmenting attention spans as well. I think it's a really interesting point we're at at the moment where we're very, erm, vulnerable to distractions at any given point just because we've got so many things bearing on upon us and people are constantly complaining about the ever decreasing attention span, but then we've seen this big resurgence, not resurgence, this first time, this phenomenon in the last 10 years of people wanting to binge on box sets of drama and I just wonder if there's a very interesting tension there between erm people who can only watch something for 5 or 10 minutes before watching whatever's coming up on their screen versus people who can lock themselves away for 18 hours and watch a whole season of The Wire without surfacing for fresh air, erm, yeah, so I think it's a little bit too glib to just say that attention spans are disappearing.

Researcher: Yeah, I would agree with that I think, and it's a really interesting point, I think that's an easy thing to say, whereas in fact it might just be, erm, I mean, there's two factors aren't there the one that if a device is there, if the Internet is always at your fingertips, erm, maybe you will always be distracted, it's

just too interesting a thing. But also in a way, I would say, a lot of the behaviour that I've sort of seen in users is that they will tend to be sort of diving deeper on kind of things that they're watching when their attention is diverted, it's often that we're so hungry for information now, because we know we can get it and we're all getting pretty good at discerning the, you know, the right stuff from the bad stuff I guess. So yeah, it's an interesting point. I'm interested in what you say about your audience in particular, erm, have you ever thought more specifically about the challenges younger audiences and perhaps the idea of, erm, more novel formats.

Participant: Yeah so there's something that I'm kind of working on at the moment. Presumably you know of the new BBC Taster website...

Researcher: Yep.

Participant: ... erm, so I've been promising to write a proposal, I pitched this a few weeks ago, er, an idea called Restoration Tinder. So, if you look at all the portraits from the second half of the 17th century and the court of Charles II and basically you've got all these incredibly glamorous people trying to look as attractive as possible. In the majority of cases it's women trying to get into the favour of Charles II who had dozens of mistresses and something like 17 illegitimate children and, erm, all these portraits come at a period when for a long time the rule of Oliver Cromwell suppressed things then the restoration in 1660 caused this big revolution of culture and just like more lax morals and in a sense that just reminds me of the impact of Tinder and these dating apps of the last five years where you can swipe left or swipe right based on the immediate judgement of a person's personal appearance.

Researcher: Yeah.

Participant: And so yeah I've been trying to think of a way to make some of the content around that moment in the 17th century interesting to an audience who are more familiar with that kind of, er, interaction and that kind of, erm, interface

Researcher: Yeah, it's a really interesting idea.

Participant: Yeah. Actually, what's kind of halted it a little bit recently is that there's no actual TV series that's being made at the moment that it could obviously, that it could piggy back on, erm... so theres a big Simon Schama series that's being made by an independent company that'll be broadcast in September about the history of portraiture, but it doesn't do that period and then I've just been distracted by other things...

Researcher: Mmm.

Participant: ... I've also just finished making a documentary...

[PARTICIPANT PROCEEDS TO TALK ABOUT THE SPECIFICS OF THE DOCUMENTARY]

. . . so I've been speaking to the iWonder team about trying to use some of our extra material, erm, because we just filmed some really gorgeous visuals of the [documentary location] and there are some quite nice bits and pieces associated with that that I wouldn't mind turning into er an iWonder just to give the programme a little bit more shelf-life as it were and more of a digital footprint erm but you know with all these things it's always just difficult to navigate all the various channels to. . .

[THE VIDEO CALL CUTS OFF - THE RESEARCHER AND PARTICIPANT RE-ESTABLISH THE CALL AND THE RECORDING BEFORE PROCEEDING]

Erm, yeah, anyway, the Restoration Tinder idea is something that I just think might attract, legitimately attract, younger audiences who might just be curious about the novelty of it and I think the er, the iWonder idea is still very much in the 'worthy' territory of educational arts material. . .

Researcher: Indeed, yeah.

Participant: . . . which is fine, if the onus is on us to provide that, I do do that obviously.

Researcher: It's interesting you talk about, with the Tinder idea, very specifically about an interaction mode that they're more familiar with.

Participant: Yeah, because I think why, why do we try and reinvent the wheel every 3 months when it's there, and the other thing about that functionality of Tinder is that it's not, I don't think there's any. . . well, I haven't explored this thoroughly but from initial digging around I don't think there's any big IP issues because the whole thing was started by Grindr, that interface of swipe left and swipe right, and the different companies, so I don't think there's any copyright issues associated with the bare bones of that interface.

Researcher: No, that is an interesting idea, erm, I think that, erm. . . so one of things really that we think of with like multi-screen TV is kind of trying to think about how you would engage, so how you would create an experience such that something could be added, so you could augment erm a programme such that it added those kind of, some of those things you were talking about: interaction modes that people were used to, for example and but it was you know sort of additive and then kind of as you say the older audiences who maybe aren't gonna become au fait with erm er new devices would still have the programme as it existed and then you kind of can augment and change that for a younger audience, is that something that from a sort of from a overall, from an overarching point of view, is that something

that you think is, is possible?

Participant: Yeah I think what you have to do is—you have to create layers. So I was interested recently in, I'm sure you're familiar with the web pilot of The Murder of Laura K?

Researcher: Yeah, yeah.

Participant: I really liked that, I thought it was really, really good. I talked to my colleagues about it and a lot of them are kind of very frustrated—they found it very frustrating because they thought it was too overwhelming initially.

Researcher: Hmmm.

Participant: And that instantly made them check out of it. I think, you know, I sympathise with that because I've thought that can be the way sometimes when you see these interactive documentaries...

Researcher: Yeah.

Participant: ...the ones that really do try and, erm, nudge you into clicking a button at specific points. I think it's very difficult to predict, even for an algorithm to predict, exactly when the individual members of the audience will feel motivated to, erm, to learn more and I think you just really have to segment, erm, the various levels of interaction because some people will always want that all consuming comprehensive experience and just have access to absolutely everything and other people will want as little tertiary information as possible, erm...

Researcher: Is that something that you think is, erm, is...

Participant: It's a challenge.

Researcher: It's a challenge but it's one that you could see being overcome? Like, it's not a dealbreaker for you?

Participant: No, no, I think like a lot of this it will inevitably be overcome, erm, and I guess by someone more intelligent than us and that's alright, but I do suspect that's where some of these things really haven't taken off because they, erm, they expect everybody to want to interact to the same, er, level—and I don't think that'll always be true.

Researcher: Yeah.

Participant: That'll always come down to differences between individual people, but people will feel more compelled to do different things just by their mood at different times of the day or whatever so obviously you can't get into a position

where you have to design an infinite amount of experiences because that's not, erm, that's not really feasible either.

Researcher: Yeah.

Participant: So it's just you know it would be great if there were great algorithms that can be a bit more adept at that but I think the way we get there is just by trial and error.

Researcher: Yeah, I think that's true, I think prototyping these experiences is going to be a big learning curve I think and some experiences will fail and some won't, and I think, as you say, at the moment there seems to be very much, particularly in terms of documentaries, like two camps, like those which are the traditional lean-back and those which are full-on, as you say, and can be overwhelming and there doesn't seem to be a middle-ground. Which is kind of one of the things I'm interested in because I think that it must exist and once you find it, the sort of, the happy medium between those two things, erm then it becomes easier to concertina between the two extremes, I think.

Participant: Yeah, like the Goldilocks effect.

Researcher: Yeah.

Participant: Erm one thing, this is something I've been discussing with my colleagues about, is I think that video should have a very reduced role on second screen interaction I think erm, I have some friends, I should probably put you in touch with them, the science team have just made a series for BBC Four about forensics and you know how to solve a murder using science and they've put together, I think it's for Taster, some online project that allows er the audience to really play as a character

Researcher: Oh excellent.

Participant: But it just—it uses a lot of video of dramatic reconstructions

Researcher: Right.

Participant: And for some reason, I don't know why, I feel a little sceptical about that I, erm...

Researcher: It's er, my immediate thought is that two streams of video is just it's overload isn't it, it's instant overload.

Participant: No, no definitely.

Researcher: And our handheld devices are personal devices and even laptops we

use them to interact with textually still.

Participant: That's what I think, I still, even with the iWonder stuff I always find a little bit of a, erm, it just doesn't work to move from reading text or clicking things when your brain's in one gear and then obviously you have to make this awkward shift to then sit back and be lectured about something for 2 and a half minutes and then go back into this process of reading and clicking because it just inevitably is going to break the flow and for me personally, I don't know if I'm unusual in this, but I always find that a bit of distraction. I think you can get away with stuff like you know Vine-style 6 second bits but I actually, erm, if it was up to me I would try and avoid anything more than that.

Researcher: Yeah, erm, yeah I agree with you and I think... so for me we should be focusing on interaction modes and how those things can, er, can help us to deliver something more exciting on second screen as opposed to video.

Participant: Mmm.

Researcher: It's interesting to me that, erm so it's almost like every screen that we have—the size of it determines, really, how we interact with it and, erm, how far away we sit from it also does that and I think in the case of how we interact with handheld screens, erm, particularly smart phones, its very much a one way thing, its very textual and its very learned interaction modes and then with televisions its obviously pure video and you sit 10 feet away, when you're watching TV of course not when you're playing a game erm but with a tablet you're in a whole other world it can sort of perform both of those things and you can watch video on it quite comfortably and sort of look at very large images erm and enjoy a very image heavy article, but you can also be very interactive with it two seconds later. So I think some of the issues are maybe down to the platform in itself that people are expecting the users to be using and, er, yeah, so I think we don't have that nailed down yet.

Participant: Yes its er, it's tricky.

Researcher: It is, yeah.

Participant: Do you know of an app, of a tablet app, that allows you to multi-task as it were with a, erm, with a TV screen or with a video feed of some kind embedded in there as well? I'm just, I remember someone trying to pitch a while back, just saying that each channel should have its own app, a BBC1 app which then is constantly being updated with material related to the programme at hand.

Researcher: Yeah I see hoe that makes sense because you don't want to download a new app for every programme.

Participant: Yeah precisely, because it just, that's another thing that people... We

did this digital day up here about a month ago and er this woman came in from the company that makes those amazing apps the ones about Shakespeare's sonnets and Beethoven's symphony and the sonata and, erm, the Wasteland all those, great stuff, but they all take up about two gigabytes on your tablet and I asked the question: well, you know, I've had to delete half my content to look at the stuff before your presentation and it's "oh well we thinl our audience'll want to cherish our material so much that they won't mind the space it takes up" and I think that was, er, she made a joke out of it and said that like we are to set to be moving away from that and target that but that's...

Researcher: It's very, erm, what's a good word here—it's quite conceited I suppose

Participant: It's conceited yeah, but it's also, I think, you know, we obviously are hurtling into a period where everything is done as a live-stream of data.

Researcher: Yeah.

Participant: Whether it's Spotify, Facebook, YouTube, we just don't store anything anymore we're just constantly in receipt of the streams of information and, erm, I think that that's something to be very aware of as well.

Researcher: Yeah erm I think so too it's the trade off between what people are willing to invest versus what you can offer them and I think actually we make too much of an assumption on what we think people should invest their time in—because even some of the demos on Taster, for example, require certain browsers eat a certain version and I think translating those data-streams properly for every user is really important as well

Participant: Yeah, well, obviously the BBC has a particular commitment to universality.

Researcher: Exactly, yeah.

Participant: And you know it's part of the charter and it can't be compromised and related to the charter renewal is knowing that everything works, only to find out it only works in Chrome.

Researcher: Or it takes up 2 gigabytes of space on your tablet.

Participant: Yeah, unless, I think that the iPlayer is definitely the most impressive tool arsenal.

Researcher: It is yeah, but it's sort of, we have to...it's almost like we have to think what's the next generation iPlayer now. You know it is an amazing tool in the arsenal and it will continue to exist as amazingly as it does, erm, so what's the

kind of what's the evolution on that? you know what's the next episode.

Participant: I think that the exciting thing there is now that there's a commissioning editor for iPlayer with, erm, with a big production budget.

Researcher: Mm.

Participant: Who can commission content, which is great, which then doesn't strap us in to the tyranny of the, you know, the delivery times of 28 minutes or 59 minutes or...

Researcher: Yeah.

Participant: ... not being "ooh is this too dark for half 7 BBC2, or is this..", you know, just those kind of concerns erm start to evaporate. It'll be a long time before the stranglehold is firmly, erm, gone but it's really, really urgent to see erm the beginning of the end of that because it just er strangles creativity.

Researcher: Yeah erm...

Participant: The schedules I, and I think I'm definitely, I think schedules are really important and I think it's err it's ludicrous to print their demise because I think people always want the watercooler moments, where they can talk about it the next time in the office after everyone else has watched it, or if everyone watched the FA Cup Final or that the vote is split...

Researcher: Yeah, there'll always be a place for live but erm...

Participant: And event television.

Researcher: Yes, yes absolutely. But yeah its more like scheduling becomes, instead of scheduling we have more of an indicator so that people can make their own choices about how dark they feel at half past 7 on a Tuesday.

Participant: Yeah, well, exciting times.

Researcher: It is yeah they are, I think that, yeah, something like Taster is an amazing platform, they have this view which I share that we should always be prototyping and that the best way of communicating with our audiences is through just building these new experiences and trying them out, as you said, through a lot of trial and error. So thats one of the things, that's something that I would like to do. So you know I mentioned that this would include a second interview as well?

[THE PARTICIPANT AND THE RESEARCHER MAKE INITIAL ARRANGEMENTS FOR THE SECOND INTERVIEW]

C.3 Second interview transcript

[THE RESEARCHER BEGINS THE RECORDING, THE RESEARCHER IS ABOUT TO BEGIN PLAYBACK OF THE PARTICIPANT'S CHOSEN TELEVISION PROGRAMME]

Researcher: So I wanted to...

Participant: I think, I think this is the right one of programmes I've worked on for this kind of project.

Researcher: I think so too, like, I wasn't sure when you first said it but only because I wasn't sure what format it would take but I think I've had a few thoughts as I was watching it and, I don't know, have you had any like specific thoughts about it?

Participant: No not really, er, let me just, is it easier if I sit here?

Researcher: Yeah maybe, may as well, erm...

[THE RESEARCHER BEGINS PLAYBACK OF THE PROGRAMME, THE OPENING SEGMENT IS A GENERAL INTRODUCTION BY THE PRESENTERS TO THE MANCHESTER INTERNATIONAL FESTIVAL]

So, er, one of the things I thought was, like, as they're talking about some of the locations like you don't get a sense of, erm, geographically how things are spaced...

Participant: Mm-hm.

Researcher: ...which is something quite...

Participant: Well, I think that that's quite interesting, that's something that if you lived in Manchester you'd be very, very conscious of...

Researcher: Yeah.

Participant: ...but I'm not sure you'd be as conscious of it if you didn't come from there, yeah.

Researcher: Like you wouldn't, you wouldn't think oh I will do that because I don't know where that is.

Participant: Yeah.

Researcher: Yeah that's true.

Participant: But I was thinking if you watch stuff in Glasgow, or in Dublin, in fact I'll get really angry that I'm not getting any information about locations/

Researcher: Mm.

Participant: You just, you really want to kind of map it down in your mind.

Researcher: Mm.

Participant: But no I think it's a relevant thing, but I think that it is...

Researcher: It's a bit...

Participant: ...it's interesting—if you want that, you really, really want it but for everybody else, there'd be...

[THE WONDER.LAND SEGMENT BEGINS IN THE PROGRAMME]

Researcher: Yeah they'd be like not very interested, erm...oh, this is the wonder.land...

Participant: Hm.

Researcher: So, one of the things about this which I thought was, erm, obviously it's quite a long interview segment.

Participant: Mm-hm.

Researcher: And it's really nice when you get the er overlays of...erm not overlays anyway, like the cuts to the cinema...

Participant: Oh yeah, the papering over.

Researcher: Yeah.

Participant: Right because we recorded that, and then saw that he stops and starts talking off topic...

Researcher: Yeah.

Participant: ...and that visually doesn't work...

Researcher: So you pretty much like just...

Participant: So you end up wallpapering over that kind of stuff, and you see these sorts of shots.

Researcher: Yeah.

Participant: So what it is...

[THE PARTICIPANT DESCRIBES IN DETAIL HOW THE SCENE ON SCREEN OF A WONDER.LAND EXCERPT WAS ACTUALLY SHOT]

Researcher: Yeah, so erm like, shots like this, I think they might work really well, like as the interview's going on.

Participant: Mm-hm.

Researcher: To have these visual images or this continuous shot without erm the audio...

Participant: Yep.

Researcher: ...like, so, you have something that you refer back to...

Participant: Mm-hm.

Researcher: As they're kind of talking—something that is contextually relevant to what they're talking about—what do you think?

Participant: Yeah, well, I was thinking about the things that you might do, first you tell the audience the information that you're given in the interview...

Researcher: Mm.

Participant: And then at the end of it, if you're still curious about the subject matter you might want to, like, 'Okay, now I can go back and watch that first thing again and spend a little bit longer because I know there's more about the relationships between the avatars, or the foundation, or the old and modern, and...'

Researcher: It's almost like you want, sort of, if we were thinking about this like interactively...

Participant: Mm-hm.

Researcher: ...like, at the end of the segment you could have, kind of, an option erm where you could freeze the video at that, the TV or whatever, at that stage...

Participant: Mm-hm.

Researcher: ...and jump in and, like, get a bit more, or go back and review.

Participant: That's one of the things that just, watching that there [THE PARTIC-

IPANT IS REFERRING TO THE JOHN TENNIEL DRAWINGS ON SCREEN], was we... in the original interview they spoke a lot about the influence of these drawings, the John Tenniel drawings that accompanied the first publication of Alice in Wonderland, and I put them in as wallpapering...

Researcher: Yeah, yeah.

Participant: ... and as cut-aways...

Researcher: But actually it might be nice...

Participant: But it might be nice if there was actually a little bit more of the illustrations, and you could just... it's the kind of thing that people might want to know, 'Oh actually, I'm interested.'

Researcher: That's the diving deeper thing, isn't it.

Participant: Yeah, and everyone knows these illustrations, they play such an important part in our childhood, but there's, they're sort of subliminal because we encountered them so young we don't really know much about the origin.

Researcher: It's interesting you say that because I think even watching the interview again it's all... that interview is quite strange because they're talking about the lack of narrative, and subconscious, and it's all quite meta concepts...

Participant: Yeah.

Researcher: ... so it's er... it would be nice to have erm, yes I imagine some people would want something to ground them and like getting a bit more information...

Participant: Yeah.

Researcher: ... about those, err...

Participant: And Alice in Wonderland is just the gift that keeps on giving as well.

Researcher: Yeah.

Participant: It's just, there's so many—you can treat it in so many different ways, that...

Researcher: Mm.

Participant: ... and, it's, she—it's this odd piece, erm, I did like a first cut of the interview where...

[THE PARTICIPANT TELLS A PERSONAL STORY ABOUT THE FILMING OF THE INTERVIEW SEGMENT]

. . . and then obviously, but, you know this is interesting as well [THE PARTICIPANT IS REFERRING TO THE VIDEO GAME AVATARS BEING DISCUSSED IN THE INTERVIEW], because our target audience would not really know much about Skyrim, and you'll see the Sims in a second now as well. . .

Researcher: Yeah, so that, that is, you're right actually the audience that you're aiming at, like, avatars and this whole world, would be. . . so to me, obviously this all makes total sense. . .

Participant: Yeah.

Researcher: But yeah, an avatar would be quite strange thing for some people to grasp.

Participant: Because yeah it is, just in itself it is a difficult thing to get across, things like your online identity is not necessarily your real identity, you, you erm curate it, you shape it. . .

Researcher: Yeah, yeah.

Participant: So you know, if you wanted to do something really bold, you would do this with something, I mean this is quite a small programme, it's a one-off thing on BBC Four late on Sunday night, but you know obviously, if it was a much, much bigger piece in itself you could, er, allow the audience to, with a second screen, create their own avatar.

Researcher: Totally, and that would be again opening it up to a much younger audience who wouldn't usually watch this sort of thing.

Participant: Mm-hm or people who'd like to.

Researcher: So, it feels like in this one segment, it's quite rich because they're talking about this world and the sort of meta concepts so, erm, there are a lot of points where you could sort of jump off. . .

Participant: Yeah.

Researcher: . . . and, erm, do something interactive or get more information about stuff and then maybe at the end of the segment for different users, because I'm already starting to see like the layers like for older audience learning more about avatars and what that means, what they're used for, erm but for younger audiences like creating an avatar in the wonder.land world and getting those actual visuals erm is another like layering off sort of thing so that's quite, I quite like that. . .

Participant: Yeah, no, yeah it's funny because I'm conscious that maybe I'm suggesting this because my head is in this world mostly...

Researcher: That's good though, that's the point so...

Participant: Yeah I know, though maybe there's something more appropriate that I've done in the past, but the fact that this is short form content makes it strong to me, because it is—it suits the grasshopper brain. As I said, normally I do kind of presenter-led things, I guess, half-an-hour, an hour long and they're a little bit more, erm, tricky to layer on.

Researcher: You can imagine they're quite heavy cognitively, like you have to invest in them, but this one, it does make you... it's more short form and you can dip in and out, I think.

Participant: Yeah. Because obviously if one section interests you and one doesn't, then you can fast-forward over it, or talk in the background...

Researcher: It almost lends itself really well to an interactive format.

Participant: I remember being, I think, is it the performance next?

[THE CHOIR PERFORMANCE SEGMENT BEGINS IN THE PROGRAMME]

Researcher: It is, yeah, so I wondered about that, what you thought about that, because obviously between items we cut away to...

Participant: Performances.

Researcher: Performances, and er, and that feels like more like something that you would, I'm not sure, if you would, but it feels like more like something you would sit and enjoy?

Participant: Yeah.

Researcher: As opposed to trying to like, engage with it, does that make sense?

Participant: Yeah, no, because they're fairly—the only thing, I think the first performance is the choir, as I say I'm not totally sure what happened here because main my involvement in this was directing the wonder.land and Tree of Codes segments. With this, the idea behind it is that it's er Arvo Part the Estonian composer erm has created these songs to go alongside a set of Gerhard Richter paintings and I don't think I saw the...

Researcher: Oh right.

Participant: . . . Gerhard Richter paintings on stage that night, or any footage of them. . .

Researcher: No.

Participant: So I'm wondering if. . .

Researcher: That is very interesting actually. . .

Participant: It might be a rights issue, I know they went to the festival people about it and spoke, but it obviously didn't happen.

Researcher: So in terms of rights with research and prototypes, because what we would do is only go in front of a small number of the audience before going live, we don't want to worry about that sort of thing as much at an early stage, like if we can prove the concept. . .

Participant: Yep.

Researcher: Then in the future it's something that hopefully would end up in part of the rights, you know, chain.

Participant: Like, for us, we're always worrying about the exact text we have to put on screen to cite things.

Researcher: I think it's, it's, that's come from like a long history of having all of those rights chains exist but like, it's almost like, we have to have these conversations to kind of be able to erm start investigating so we don't fall behind, so we tend to not worry as much when we're at, like, a prototyping stage about that sort of thing.

Participant: I always describe my job as common sense plus copyright law.

[THE SKRIKER SEGMENT BEGINS IN THE PROGRAMME]

Researcher: Yeah.

Participant: You have to know a little bit about copyright. Especially for things like art, like art can get really like, and especially with performances like things modern theatres, like, this is OK [THE PARTICIPANT IS REFERRING TO THE SKRIKER EXCERPT ON SCREEN] because if you say well we're promoting your show but if you're doing if I wanted to use this footage in a show. . .

Researcher: Aside from this. . .

Participant: . . . like next year. . .

Researcher: Yeah, yeah.

Participant: . . . and I wasn't going down the dealing with the promotion route then it becomes, fees, musician fees, and it starts to get. . . because it does become so prohibitively expensive, orchestras in particular are very, very difficult.

Researcher: Mm.

Participant: Yeah, they, just because they're so unionised and in a sense you know, fair play to them. . .

Researcher: Yeah.

Participant: . . . I think that's the way it should be, it just means that it doesn't, with the Internet, and with. . .

Researcher: Yeah, the old models don't, erm, help them in a way.

Participant: Nope, no they just shoot themselves in the foot. So, with The Skriker, I think, I would have loved to have in front of me, I mean, just the text of the play itself, because it's all about crosstalk and word play and so on.

Researcher: I also felt the same thing, so I noticed that you put in actual shots of the pages. . .

Participant: Mm, well I wasn't that much involved with this one. . .

Researcher: Oh right.

Participant: . . . yeah. I saw the play, but I wasn't that much involved. . .

Researcher: So it's interesting you say about that then, because there are actual shots. . .

Participant: Oh OK.

Researcher: . . . of the text erm, and I imagine that was why. Yeah I think actually having some examples. . .

Participant: Yeah.

Researcher: . . . of exactly what they're talking about to peruse would have been I think would have been—would have, erm, grounded it more.

Participant: Did you see this one. . . ?

[THE PARTICIPANT TELLS A PERSONAL STORY ABOUT SEEING THE

SKRIKER]

BBC Four did a great thing, I wasn't too involved with it, but it was a 6 part series, the Secret Life of Books.

Researcher: Yeah.

Participant: There was an interactive thing made with it where you could jump in to the text on a touch screen, and it was really, really well done.

Researcher: Oh yeah, that's interesting. So it seems like, with this one, I kind of think it seems like something about the words, like opening up the wordplay giving some examples and explaining it, and being able to jump in and explore that a bit more, that seems like the obvious way to go here.

Participant: Yeah, yeah, no I think I would definitely just like an annotated copy of the text in front of me, especially for this scene, for this monologue we're showing now [THE PARTICIPANT IS REFERRING TO THE SKRIKER EXCERPT ON SCREEN].

Researcher: So you can dip in and out.

Participant: Yeah.

Researcher: Yeah, erm, OK cool.

Participant: And also they I think they talk in the interview about The Skriker having 5 or 6 different incarnations...

Researcher: Yeah.

Participant: ... and a sort of Top Trumps, you know of the characteristics of each of the different erm characters...

Researcher: Top Trumps is a great idea, what's great about this is with everything, there's like multiple ideas that could suit multiple audiences?

Participant: Oh yeah, yeah totally, and that's because there's so much diversity at the festival. It was my first time in Manchester, and I was just so impressed with the city.

Researcher: Yeah, it's really vibrant.

[THE JOSEPHINE ONAYAMA PERFORMANCE BEGINS IN THE PROGRAMME]

Oh, did you go to this?

Participant: She was brilliant, well I just saw it last night.

Researcher: Oh just the, yeah, yeah I thought so too.

Participant: All you'd want here is a small just kind of like biography, who is she, what's she done, where is she from, things like that.

Researcher: Mm, because I think there would definitely be people who, erm, want to know who she is so that they can remember for like future reference and then afterwards. Yeah I think that makes sense totally.

Participant: But, but not much more than that, because I think anymore, it undermines her...

Researcher: Her performance, yeah, and I think, that's why with the choir one as well having those, having the images as opposed to just biography, it just feels like it maybe the performances should stand alone.

Participant: Yeah. It's weird because the performances were calibrated to the images something must have gone wrong, or been forgotten about.

Researcher: Oh right.

Participant: But I don't know why, if they weren't allowed to show the images, why the choir still went ahead.

Researcher: Yeah, that's really interesting.

Participant: But that's obviously the route you go down. And wasn't she brilliant [THE PARTICIPANT IS REFERRING TO JULIE HESMONDHALGH].

[THE PARTICIPANT TELLS A PERSONAL STORY ABOUT THE RECRUITMENT OF JULIE HESMONDHALGH FOR THIS INTERVIEW]

Anyway, so, what would you do with this interview, I think you would just get old material and show it, because they talk about previous years, so I think at this point, you'd just get up the programmes for previous festivals.

Researcher: Yeah, programmes actually is a good one, because they talk a lot about the Masque of Anarchy, I think, is that the one?

Participant: Yeah.

Researcher: The one, the Maxine Peake with all the candles.

Participant: Oh, the Peterloo thing—yeah.

Researcher: Yeah and the warehouses and stuff, yeah I think getting up programmes, because you see less visuals of actual previous festivals, again that might be a rights thing, but yeah I think it's something that er we should definitely, if you can prove the concept that erm it's worth fighting for these things then that's what we're sort of aiming for.

Participant: Yeah, with rights, the way these things work changed in the last 4–5 years, and this has actually been quite transformational, is instead of actually licensing things appropriately what we do is a process called 'fair dealing'. So fair dealing means you can use, erm, any performance extracts or any, erm, anything that's in copyright be it a literary text, be it a bit of music, a photo, a film, as long as it's for the purposes of critique and review...

Researcher: OK

Participant: So fair dealing has this statute that allows, you know, a review programme to talk about a particular piece of work without fear or favour erm so they don't have to, you know, the production company mightn't actually license something erm to a review programme if they know they're going to slate it, so it allows us to review something but also basically means you're not paying for it, but that's why all that text is always on screen because that's one of the elements of fair dealing. Fair dealing doesn't automatically license and clear your usage of the material, it's just a defence to use in court if they sue you for breach of copyright.

Researcher: Hm.

Participant: It is, it's pretty watertight...

Researcher: It seems like widely used...

Participant: ... but it's only in the UK.

Researcher: Oh OK.

Participant: So when I'm working on a programme, sometimes if you have a worldwide partner, BBC Worldwide or Open University, then you can't, you just can't do any fair dealing, everything has to be cleared in the appropriate way, but for something like this which is UK TX only then, then it's absolutely fine.

Researcher: Yeah, yeah cool. So I think thats, that is good because I think that's the perfect thing to do here...

Participant: Yeah.

Researcher: ... is go back and talk about the old festivals, because they do, they talk about it in quite a lot of depth, and they're trying to conjure the visuals...

Participant: Yeah, and you can use the, the programmes, and if you've never heard of this, for context and comparison as well, so if you were... And then you know maybe, a map of the city just as well, I mean this is the point that maybe you would want an idea of the shape of things at the festival.

Researcher: Yeah maybe, I think this is probably the only appropriate moment to map it out now, marking out the Royal Exchange and like the theatres and stuff erm or where they are right now and then going from there. Cool.

Participant: I think this was all filmed this day last week...

[THE COMEDIAN'S PERFORMANCE BEGINS IN THE PROGRAMME]

[THE PARTICIPANT EXPRESSES A PERSONAL OPINION ON THE COMEDIAN]

Researcher: But again I do think that like erm this might be this could be obviously personal profile, but it's, it's you know I'm not sure, it might be like kind of because Mark sort of introduces him and says like what he's been up to like how he's been coming up on the circuit so I think it might also be as simple as that.

Participant: Yeah, but maybe a little bit of detail about Thomas Piketty's 'Capitalism for the 21st Century' as well if you're into that kind of thing, if you find the comedy too boring and you want to do some hard work, some hardcore economics! Erm

Researcher: Yeah, this is actually, because I think it probably won't just be us who want to... I felt quite bored and like I could jump into something else at this moment so yeah, that's a good idea actually. It's the right time to jump down. It's not funny enough to like just stick with this on its own.

Participant: In some way I think it's good to do, you know, to do this. Because you just you give people a chance to, and sometimes it works and sometimes it doesn't but if you've never...

Researcher: But that's the same, erm, it's almost like a reflection of the festival itself.

Participant: Yeah, yeah.

Researcher: But the, I mean, in general, the performances were really amazing.

Participant: You'll probably find that even though this is a late night slot, lots of people were there looking for exactly this sort of thing.

Researcher: Yeah, yeah that's true. Ooooh, this bit.

[THE TREE OF CODES SEGMENT BEGINS IN THE PROGRAMME]

[THE PARTICIPANT TELLS PERSONAL STORY ABOUT PROCURING THE INTERVIEW WITH THE MAKERS OF TREE OF CODES]

So in this I think there's lot's of things you can do because the book it's based on is so central, but how would you do that digitally?

Participant: Because it's the physicality isn't it, I know, that is a bit of a challenge but I think it's worth thinking about...

Researcher: Yeah.

Participant: ... because erm it's definitely something, because he's clearly trying to show it and he can't quite...

Researcher: Do you get the concept of the book, do you erm, because I found it quite difficult you know beforehand actually.

Participant: Yeah, I don't actually.

[THE PARTICIPANT CONTINUES TO EXPLAIN THE CONCEPT OF TREE OF CODES]

So I think erm, rights issues might make this difficult, but I think erm I think you do just take a route through the story and then apply the Tree of Codes effect to it.

Researcher: Yeah I think that is the right thing. It might be a rights issue but again it's worth...

Participant: Yeah.

Researcher: ... piloting because it could be really cool.

Participant: Yeah. I think you'd want a little bit of that but then there's a beautiful thing actually the music it was really, I actually I've taken an audio feed from the camera the music was so so good

Researcher: Yeah I think the actual performance segments in this, you're not going to get anyone, that's an unnatural time to look away from the television, because everything that they're talking about, all the interviews, everyone's talking about quite high-level stuff really like you have to know your stuff because its been inspired by really obscure things which aren't the norm so it would be, it is nice, the ides of being able to jump down further, erm and I think having the option that when somethings interactive, even some kind of automatic pause erm or like being able to pause and spend a bit more time with something, having that facility on the second

screen would be good, what do you think to that?

Participant: Yeah I just think having seen it I just want to go back and watch it again and again and again. So I think definitely just have the entire kind of 20 minutes that we recorded probably just available with the erm multiple kind of extra bits that I studio directed myself.

Researcher: Is that, would it be possible for me to get those?

Participant: Yeah.

Researcher: Can you?

Participant: Yeah? Really? There'll all on a drive up in Scotland.

Researcher: That would be... that would be incredible. Because I don't... Because I think that way, having the entire performance as these interviews are going on.

Participant: Mm-hm.

Researcher: I think that would be very cool actually.

Participant: Yeah?

Researcher: There are some people who are going to want to just watch the entire production, and some people who need to think around, as you say on the iPad...

Participant: Mm.

Researcher: If that's possible? I mean if it's...

Participant: Yeah, no, no, it should be.

Researcher: I mean if it's not, don't worry.

Participant: No, should be, erm.

Researcher: Like, not everything, like, whatever you have.

Participant: Yeah? No, no, It's, it's all on. I mean, I could bring—I filmed the one channel and there's virtually all the stuff on that, on the drive and everything for the rest of the shows on the other side, erm...

Researcher: It's just the performance stuff, not like, absolutely everything.

Participant: Yeah.

Researcher: Yeah, yeah. Erm, because I think...

Participant: You know I don't have—now, I just have to ask erm, they're on production drives I think, so erm, if you, could you, if you could send a drive up for them?

Researcher: Mm-hm.

Participant: Would you be able, if you got it, like a drive with like 30 gigabytes of space, or something, and then just dump it at our office, and then, we would just have to guarantee what you're doing with it...

Researcher: Oh yeah, that would be fine, er.

Participant: Mm. So one of the camera shots I have, it's in slow motion from the side.

Researcher: Mm. Oh right.

Participant: Yeah, which really accentuates the, the toning and the definition of the dancers and...

Researcher: Yeah.

Participant: ... the rates of movements.

Researcher: Yeah these shots are really nice.

Participant: Yeah, no, and you see, see a little bit more there of the accents...

Researcher: Erm.

Participant: ... because they're just so athletic.

Researcher: Mm.

Participant: Yeah, I, it was, I think it was, it looks to be about the way your frame works when you're in love.

Researcher: Mmm.

Participant: And sometimes it just was very luscious and sometimes very fraught and muddled.

Researcher: Mmm.

Participant: And both way. Actually it'd be good, you know, obviously the BBC

archive has him winning, you know, musician of the year, erm, I don't know if musician of the year's televised, it may just be something that only happens on Radio 3, but...

Researcher: Yeah, there'll be information there to use.

Participant: Yeah, yeah, it'll be accessible in the archive and I believe that you can go down that route.

Researcher: So it sounds, it is sounding more and more like for the performances it sort of makes it—people are going to want to know more about the performers. Especially because there are—it's one or two people. With the choirs, obviously, it's a bit different, erm, like we keep going back to, kind of, information about those people so that seems right for the performances.

Participant: Mm.

[THE NECK OF THE WOODS SEGMENT BEGINS IN THE PROGRAMME]

[THE PARTICIPANT TALKS AT LENGTH OF THEIR PERSONAL EXPERIENCE WITH THE PRODUCTION OF THIS SEGMENT]

But then, yeah, there was loads to do this, you know, erm, just previous iterations of Red Riding tale.

Researcher: Mm.

Participant: You know, there's some music, I think it was, erm, the Prokofiev, Peter and the Wolf, you know [THE PARTICIPANT WHISTLES THE TUNE OF PETER AND THE WOLF].

Researcher: Yeah.

Participant: All of that, but then, I think that from memory the main music that Helene Grimaud plays is the erm Revel Piano Concerto in G Major, the Adagio Assai...

Researcher: Oh right.

Participant: ... which I just think is stunning.

Researcher: Mm.

Participant: And it's one of the most beautiful bits of music, but it, what I loved is, she did it quite a unique rendition of it, erm, transcription for solo piano supposed to be easy but that's the version erm and every time she played one of the main

sections of it she did it more bluesy than others and just those oh, personally that's what I was really took from it.

Researcher: Yeah.

Participant: Yeah, so I think just, you know, you really just want to track, those different elements.

Researcher: Yeah, that sounds good. Erm, and again I think it's something that erm with these different elements you can do a real unpacking and make it very interactive for a younger audience and then the mus... it should be separate really, the musicians going into more depth, information-wise, about that might be something that an older audience definitely more interested in, erm, perhaps less interactive?

Participant: Mm.

Researcher: Yeah, yeah, no I think it's just about, you know, making it intuitive on different entry levels.

Participant: What's their level...

Researcher: Yeah.

Participant: ... entry level, like their level of entry with this content, yeah.

[THE FLEXN DANCE PERFORMANCE BEGINS IN THE PROGRAMME]

Researcher: Oh my God, this I find, like, I wasn't expecting it, ha.

Participant: Yeah, what?

Researcher: It's like, watching it is quite weird.

Participant: No I mean, really, yeah

Researcher: I think this is again, give more information about who they are.

Participant: Yeah. I definitely need some context for this, but I've no—I don't understand this at all so maybe like more information.

Researcher: It's crazy.

Participant: Yeah.

Researcher: It's really strange, crazy.

Participant: The music's great.

[THE PROGRAMME ENDS]

Researcher: Yeah. Erm, oh that's it.

Participant: That is it, yeah.

Researcher: Erm

Participant: Oh, well ,like at this point I'm just watching and waiting for my name.

Researcher: Ha, yeah, ha.

Participant: Haha.

Researcher: It must be a great moment, though.

Participant: Ha, erm. I feel like there's a unique... it's a really great piece of content for it.

Researcher: It really is, actually...

Participant: Yeah you know I was really, I was very getting a little too paranoid that I was just going with a bit purely because it's on the top of my head.

Researcher: No, no.

Participant: But I've actually, just last night I was thinking, well, this'll work so much better than anything else...

Researcher: Yeah, it really will. Like, they're, you're right it's the magazine-style, you can jump in and out and there are some, there are obvious segments where you're just gonna sit back and maybe there's a bit more info but you're probably gonna enjoy it, and there are moments when, you're like: 'What did they say? I really need to like engage with that', and other interactive bits. And I think there's absolutely loads to be done. Erm, and yeah. It's been really great having your head in the game as well...

Participant: Yeah, absolutely.

Researcher: Like hearing all the contextual stuff too. Erm, it makes it a lot easier for me to erm, like I...

[THE RESEARCHER CONCLUDES THE RECORDING AND THE INTERVIEW]

C.4 Paper materials for Phase 2 study

Participant Information

Thank you for considering taking part in this study. It will be a great help to the University of Bath and BBC Research & Development as part of their research into second screen experiences.

How the study will work

The study will last no longer than 1 hour. You will first be invited by a researcher to watch a television programme. During this time you will be video-recorded so that we may understand how you watch the television programme. After this, you will answer questions on the programme. Finally, you will be interviewed by the researcher. This interview will get your thoughts on second screen experiences, specifically in relation to the television programme you have watched. You will given an gift of £10 for taking part in this research, to cover any reasonable cost (e.g. travel) of participating.

Participating

Your participation in this research is considered entirely voluntary, and you are free to withdraw from the study at any time should you so wish.

During the study, you will be video-recorded so that we can analyse the data. This video recording will be stored securely and viewed only by project members, after which it will be destroyed. All information supplied by you will be entirely confidential. In the event that data generated by this interview is published, all data will be made anonymous.

Contact information

If you have any questions about any aspects of the study, or you would like to know the eventual results, the lead researcher in this study is Charlotte Hoare, who can be contacted at *charlotte.hoare.ext@bbc.co.uk*.

Participant Consent

By signing below, you are agreeing:

(1) to participate in this study
(2) that you have read and understood the Information Sheet
(3) that you understand that you may withdraw your consent at any time.

Name: _____

Signature: _____

Date: _____

Participant Details

Age: _____

Gender: _____

How many hours of TV do you usually watch a day?

- ☐ **Less than 1 hour**
- ☐ **1-3 hours**
- ☐ **3-5 hours**
- ☐ **Over 5 hours**

Do you ever use a smartphone, laptop or tablet while your watching TV?

- ☐ **Yes**
- ☐ **No**

If you answered yes to the last question, what do usually use the device for?

_____

_____

_____

Interview Schedule

Introduction

We'll now watch the TV programme together, and throughout I'd like to get some of your ideas on when you might like extra content on a secondary device like a smartphone, tablet or laptop. I'll also be asking for your thoughts on what you might like to see. I'll play the TV programme now, and start asking some questions. From time to time, as I ask questions, I'll pause the video so we can talk. Please also feel free to ask me to pause the programme at any times you think are important. I'll start the programme now.

Questions

If the researcher has paused the video:
Do you think this section could be enhanced by second screen content? Or do you think it would be diminished?

> And why is that?
>
> What second screen content would you add here?
>
> What do you think would be a good way of drawing attention to the second screen?

If the participant has asked for the video to be paused:
Why did you choose this moment to pause?

Do you think this is a good moment to add extra content on a second screen?

> And why is that?
>
> What second screen content would you add here?
>
> What do you think would be a good way of drawing attention to the second screen?

Transition

Thank you. I've just got a few final questions for you. As you know, today has been about getting your thoughts on what you might like in a second screen experience.

Questions

Do you have any thoughts on second screen experiences generally?

Do you think you would use them?

And why is that?

Closing

Many thanks for your help and time. Please feel free to contact me at any time if you have any questions.

Appendix D

Companion to Chapter 7

D.1 Paper materials for study

Participant Information

Thank you for considering taking part in this study. It will be a great help to the University of Bath and BBC Research & Development as part of their research into dual-screen experiences.

How the study will work

The study will last no longer than 1 hour. You will first be invited by a researcher to watch a television programme, which will be accompanied by a companion application. This companion application has been designed to accompany the television programme. During this time you will be video recorded so that we may understand how you watch the television programme. Following this, you will answer some questions about your experience and be interviewed by the researcher. As a thank you, you will receive a gift of a £40 Love2Shop voucher for taking part in this research.

Participating

Your participation in this research is considered entirely voluntary, and you are free to withdraw from the study at any time should you so wish.

During the study, you will be video recorded for the purposes of data analysis. This video recording will be stored securely and viewed only by project members, after which it will be destroyed. All information supplied by you will be entirely confidential. In the event that data generated by this interview is published, all data will be made anonymous.

Contact information

If you have any questions about any aspects of the study, or you would like to know the eventual results, the lead researcher in this study is Charlotte Hoare, who can be contacted at *C.M.Hoare@bath.co.uk*.

Participant Consent

By signing below, you are agreeing:

(1) to participate in this study
(2) that you have read and understood the Information Sheet
(3) that you understand that you may withdraw your consent at any time.

Name: _____

Signature: _____

Date: _____

Participant Details

Age: _____

Gender: _____

How many hours of TV do you usually watch a day?

- ☐ **Less than 1 hour**
- ☐ **1-3 hours**
- ☐ **3-5 hours**
- ☐ **Over 5 hours**

Do you ever use a smartphone, laptop or tablet while your watching TV?

- ☐ **Yes**
- ☐ **No**

If you answered yes to the last question, what do usually use the device for?

_____

_____

_____

Outstanding □ □ □ □ □ □ □ Second-rate

Exclusive □ □ □ □ □ □ □ Standard

Impressive □ □ □ □ □ □ □ Nondescript

Unique □ □ □ □ □ □ □ Ordinary

Innovative □ □ □ □ □ □ □ Conservative

Exciting □ □ □ □ □ □ □ Dull

Interesting □ □ □ □ □ □ □ Boring

Interview Schedule

First impressions

What are your initial impressions of the experience? What were your first impressions/expectations when I first told you about what you would be doing today? Did the experience meet those expectations? Did it disappoint? Why? Can you envisage this being something you would use on a regular basis? Why?

Demographics, attention, value and disruption - implicit

What two things do you remember most about the experience? How would you rate those things? Were they good/bad/neutral?
How could the experience be improved?

Demographics, attention, value and disruption - explicit

Do you like this kind of TV programme usually? Did the companion enhance the programme for you? Did it detract from the programme?
How did you find watching a TV programme in this way? How did you use the companion? Do you think you spent a lot of time looking at it?
How did you feel about looking at it? Did you feel any pressure to look at one screen or the other? Did the two screens fit naturally with what you expected from them?
Was there too much to take in? Was it a welcome distraction? Were you not at all interested in it compared to the TV programme? Did it complement the TV programme well? Were you not at all interested in either? Was it just something to fiddle with? Would you use this at home?
Could you take or leave the second screen? Do you feel it added anything to your experience? Or took away from it? Tell me more about this.

General

Anything else you'd like to add?

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